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For MINERAL PROSPECTING. The KEY to SUCCESS in GOLD DREDGING. Water and Oil Rigs. Machines in Stock at Pacific Coast Agency.
HARRON, RICKARD & McCONE, San Francisco, Cal.
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CAPACITY 600 DRILLS 10 HOURS
T. H. PROSKE
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OVER 90 PER CENT OF MINES USING DRILL SHARPENERS
USE THE AJAX.

Dixon's Silica-Graphite Paint
For the Preservation of All Classes of Metal and Wood.
WRITE FOR ILLUSTRATED FOLDER B-141.
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Robins Sorting Belt Conveyors
Require Less Power, Less Attendance and Fewer Repairs than does any other form of sorting belt.
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15-21 Park Row, New York.

IF IT LEAKS IT'S NOT A CROSBY SPRING SEAT VALVE
THEY ARE LEAK PROOF
ALL WORKING PARTS RENEWABLE WITHOUT REMOVAL FROM PIPING
CROSBY STEAM GAGE AND VALVE CO.
TRADE MARK CROSBY
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BOSTON · NEW YORK · CHICAGO · LONDON
THE WIRE COIL DOES THE BUSINESS
The Branden PUMP VALVE
WILL OUTLAST SEVERAL ORDINARY RUBBER VALVES
TRY THEM

RAILWAY EXCHANGE, CHICAGO.
CHALMERS & WILLIAMS,
Manufacturers of
Mining and Reduction Machinery.
SALES AGENTS FOR GREEN ROTARY PRESSURE BLOWERS.

MURRAY IRON WORKS CO.
Incorporated Feb'y 1, 1870. BURLINGTON, IOWA.
Corliss Engines. Pumping Engines.
AIR COMPRESSORS. MINE HOISTS.
Tubular, Water-Tube and Internal-Furnace Boilers.
COMPLETE POWER PLANTS.
Steel Plate Work. Castings.

CYANIDE SAND-VAT EXCAVATING, DISTRIBUTING AND AUTOMATIC TAILings Stacking Equipments for 1000 STAMPS ordered or in use in United States, Mexico, South Africa and Russia. Capacity 100-160 tons per hour, at a cost of 1 cent per ton. BLAISDELL COMPANY, Douglas Building, Los Angeles, Cal., U.S.A.
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THE ROESSLER & HASSLACHER CHEMICAL COMPANY,
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CYANIDE, AND OTHER CHEMICALS FOR MINING PURPOSES.

ALPHABETICAL LIST ADVERTISERS PAGE 24. BUYERS' DIRECTORY PAGE 28.

THE UTAH MINING MACHINERY & SUPPLY COMPANY,

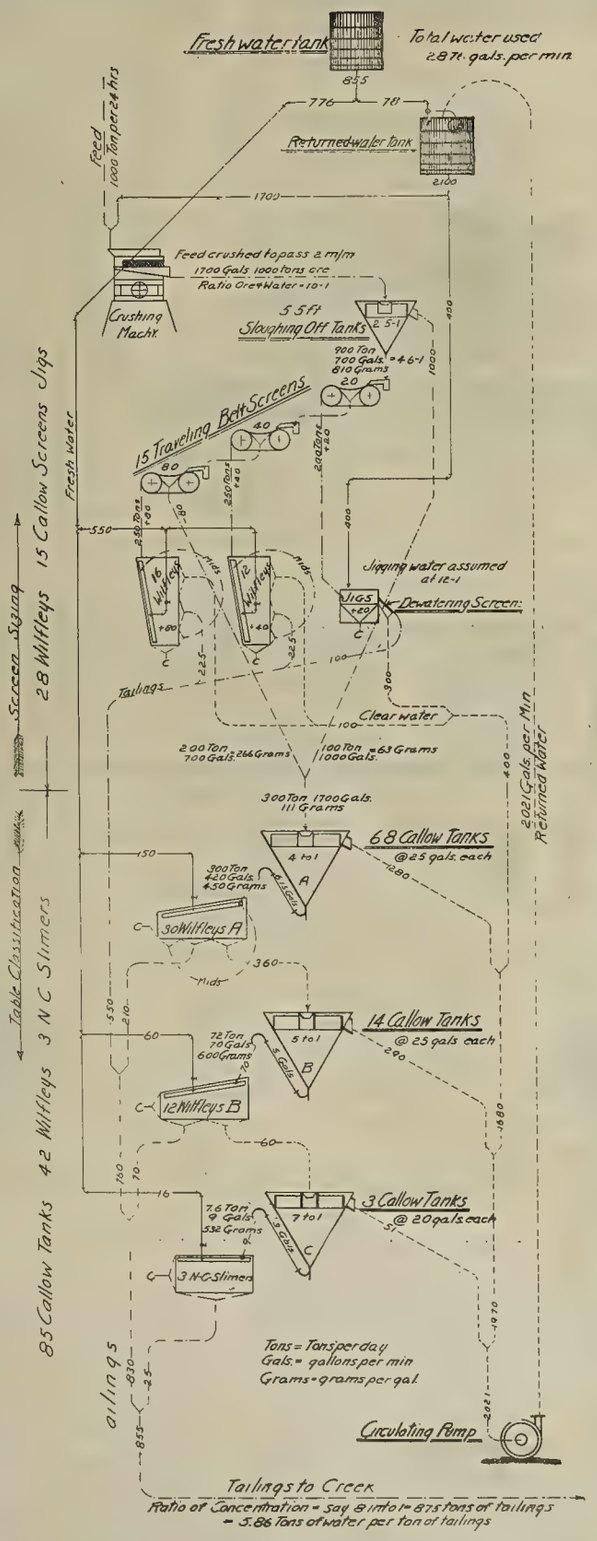
J. E. GALIGHER, Manager.

SALT LAKE CITY, UTAH.

SOLE AGENTS FOR THE UNITED STATES, CANADA AND MEXICO

— FOR THE —

Callow Screen and Settling Tank.


Fresh water tank
Total water used 2871 gals. per min.
Feed 1000 Tons per 24 hrs
Returned water Tank
Feed crushed to pass 2 m/m
1700 Gals. 1000 tons ore
Ratio Ore + Water = 10-1
Crushing Machy.
5.5 Ft Sloughing Off Tanks
15 Traveling Belt Screens
Fresh water
Sloughing water assumed at 12-1
16 Wiffleys
12 Wiffleys
JIGS
Dewatering Screens
Tailings
Clear water
200 Tons 700 Gals. 266 Grams
100 Tons 1000 Gals. 63 Grams
300 Tons 1700 Gals. 111 Grams
2021 Gals. per Min Returned Water
68 Callow Tanks @ 25 gals. each
4 to 1
300 Tons 420 Gals. 450 Grams
30 Wiffleys A
Mids
14 Callow Tanks @ 25 gals each
5 to 1
72 Tons 70 Gals. 600 Grams
12 Wiffleys B
3 Callow Tanks @ 20 gals. each
7 to 1
7.6 Tons 9 Gals. 532 Grams
3 N-C Slimers
Tons = Tons per day
Gals. = gallons per min
Grams = grams per gal.
Circulating Pump
Tailings to Creek
Ratio of Concentration = say 8 into 1 = 875 tons of tailings = 5.86 Tons of water per ton of tailings
85 Callow Tanks 42 Wiffleys 3 N C Slimers
Table Classification
Screen Sizing
28 Wiffleys 15 Callow Screens Jigs

Callow System of Ore Classification

As Applied to the Concentration of Finely Crushed Materials, and the Recovery of Operating Water.

It will be generally admitted that the greatest problem in ore dressing has been the proper and accurate sizing of finely crushed material. Hitherto the limit of exact sizing—in other words, screen sizing—has been in the neighborhood of 2 mm. The Callow screen has enabled screen sizing to be carried to any mesh, 200 inclusive, but while on a certain grade and character of ore this will be found perfectly practical and feasible, yet on other ore, less complex and of lower grade, it may be considered an unnecessary refinement. But whether 80, 100 or some finer mesh may be determined upon as the practical limit for a particular ore, there is still left in any case a wide range of undersize particles on which it is equally as important and profitable to practice some form of sizing or sorting. Any contrivance calling for additional water for this purpose is inconsistent, since these pulps are already too dilute, and if surface or whole current classifiers are used, the sorting performed by them is so crude and their several products so badly contaminated with slime that they offer no practical advantage over a simple settling scheme. Therefore, for any improvement in this department some fresh element must be sought for. This is found in the percussion table, which both concentrates and classifies, stratifying its feed not only into bands of gangue and mineral and their intermediate products, but also separating the sand from the slime more effectively than any other apparatus, and this without the addition of any water other than that necessary for the regular operation of the machine.

The practical limit of screen sizing having now been advanced from 2mm. to 80 mesh or finer by the invention of the TRAVELING BELT SCREEN, and with the CALLOW SETTLING AND PULP THICKENING TANK at hand for settling and thickening the undersize and combining these with TABLE CLASSIFICATION, a thoroughly practical and perfect system of sizing is the result, which is fully set forth in the accompanying diagram. It will be noted, moreover, that the recovery of water incident to this arrangement is no less important than the other features characteristic of the system.

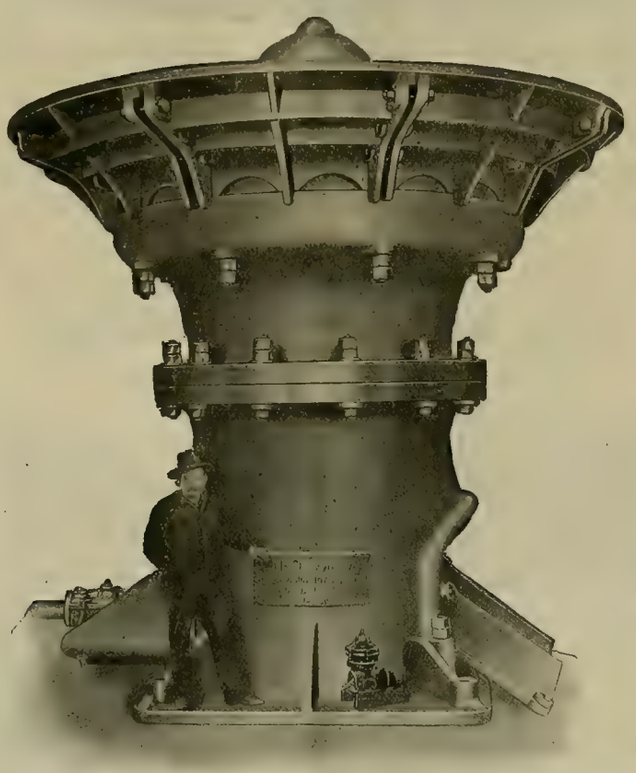
141366

POWER AND MINING MACHINERY COMPANY

McCully Rock and Ore Breakers

(The pre-eminence of the McCULLY is indisputable.)

are the only crushers with the suspended shaft which are giving absolute satisfaction. We have sold in the past six months, six No. 9 crushers, each having a capacity of 300 tons and upwards of rock and ore per hour. This alone indicates the superiority of the McCully over all other types and makes of crushers.



have the following points of superiority:

Perfect suspension device of main shaft, point of suspension being at the fulcrum or point of no motion.

Gears made of steel.

Drop bottom.

Perfect and dust-proof oiling arrangement for eccentric.

Removable countershaft bearing.

Rigid spider with large and unobstructed receiving openings.

Large capacity with minimum of repairs.

Small power required to operate.

WE ALSO BUILD AND DESIGN

Complete Plants for Mining and Milling of Ores,
American-Crossley Gas Engines,
American-Crossley Suction Gas Plants,
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WRITE FOR CATALOGUE No. 4 DESCRIBING CRUSHERS.

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CHROME, N.J., U.S.A.
(FORMERLY OF BROOKLYN, N.Y.)

CHROME TRADE MARK C C S ADAMANTINE

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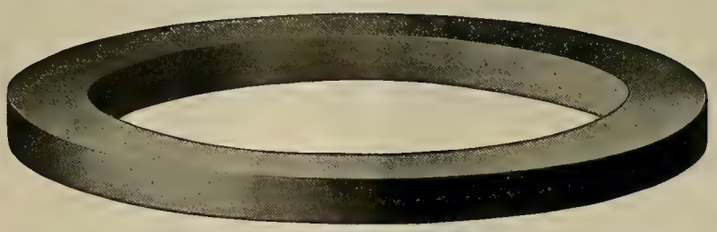
For Dry or Wet Crushing:

ROLLED TRADE ADAMANTINE MARK CHROME STEEL SHELLS AND RINGS



Forged, Punched and Rolled from a Solid Chrome Steel Ingot.

BEST MATERIAL FOR { Shells for Cornish Rolls, Rings and Tires for Chilian Mills, Rings for Huntington Mills.

Send for Illustrated Pamphlet, "Rolled Shells and Rings."

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SPECIALTIES — SOME OF THE MACHINERY THAT HAS HELPED TO MAKE THE RISDON IRON WORKS FAMOUS:

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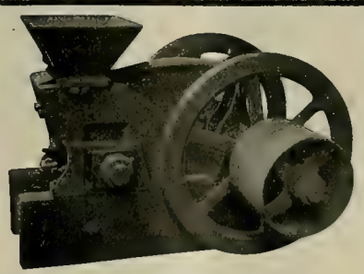
Send to us for Catalogues and Estimates on any of the above.



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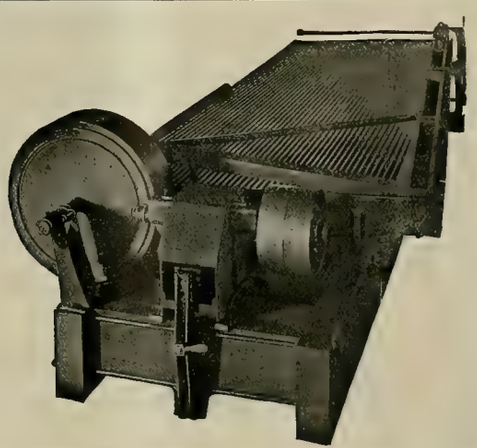
The Wilfley Concentrating Table



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THE MINE & SMELTER SUPPLY CO

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DON'T EXPERIMENT--JUST BUY THE

Wilfley Concentrator.

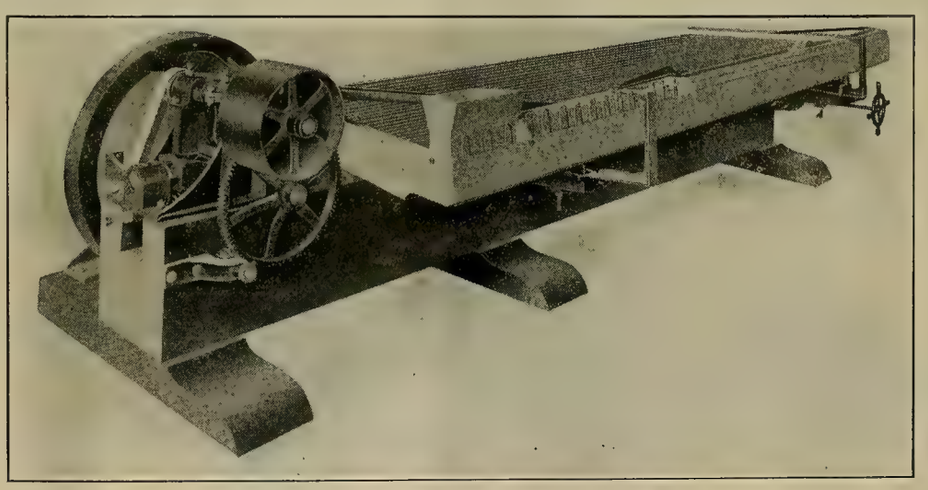
After ten years of success, during which time the Wilfley Concentrating Table has been used in nearly every mining district of the world where the ore will concentrate and has established its reputation for reliability by actual performance, is it necessary to go back to the beginning and say that the

WILFLEY CONCENTRATING TABLE

"SAVES EVERYTHING THAT A GOLD PAN CAN SAVE?"

It seems as though everybody must know it. But it is a fact, and we repeat it.

Do you think that one company would purchase over 500 of these tables if they did not consider them the best? They tested them thoroughly against all other known machines before placing their orders.



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OUR No. S-6 BULLETIN CONTAINS VALUABLE INFORMATION. Sent on Request.

We can supply you with Cyanide, Chlorination, Stamp and Concentration Mills, complete.

When you are in the market for anything in our line, write or call on any of our branch houses and your inquiries will be promptly attended to. We have in our employ competent engineers in every department who will gladly give you estimates on anything you want in the mining machinery line.

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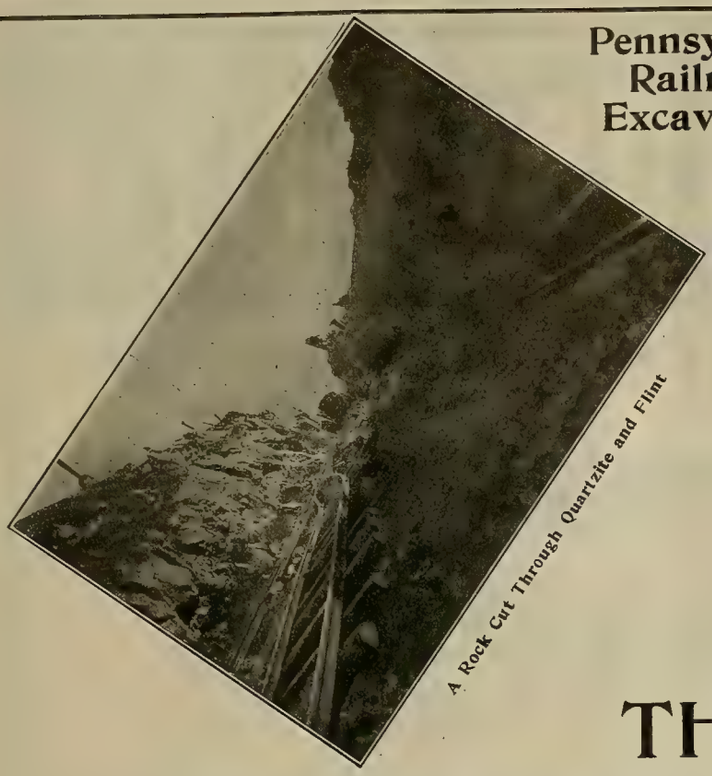
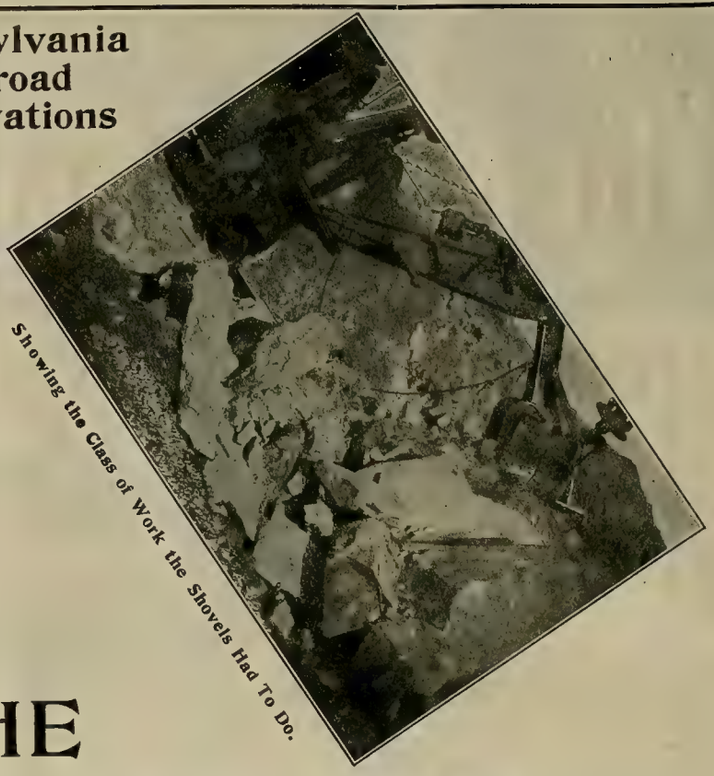


A Rock Cut Through Quartzite and Flint



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THE PANAMA TOOTH

Entirely of

Manganese Steel

"TAYLOR MADE"

NO RIVETS

STRENGTH — Quick Renewals

DURABILITY — Sharp Points

SIMPLICITY — Reasonable Price

THIS TOOTH USED ON ALL BUCYRUS SHOVELS AT PANAMA SINCE ISSUANCE OF PATENT

TAYLOR IRON & STEEL CO.

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ESTABLISHED 1855

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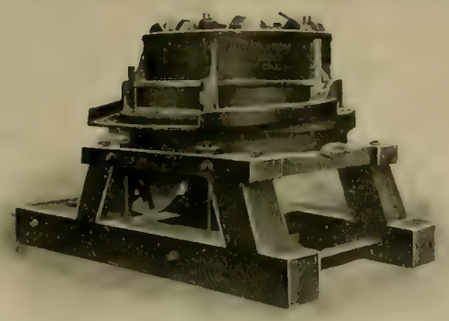
ORE MILLING AND SMELTING MACHINERY



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We build Huntington Mills, in various sizes to suit all requirements. Special catalogue descriptive of these mills will be sent upon request.

We build a 3-stamp prospecting mill for preliminary work at mines, it gives the greatest satisfaction and is very reasonable in cost.

We build a 2-stamp standard mill, with 1000 lb. stamps that is an excellent proposition for parties having small capital but desiring to push work at their mines. Specifications and price on this mill will be promptly mailed to any one desiring same.

SMELTING PLANT BUILT BY THE FULTON IRON WORKS IN ARIZONA.

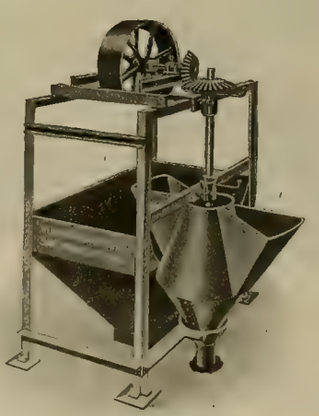
We build reduction machinery of all kinds for the treatment of ores. Crushing, grinding and sampling machinery a specialty. Let us figure with you for your requirements.

We design and build modern smelting furnaces and equipment including copper furnaces, copper converters, lead furnaces, reverberatory furnaces, roasting cylinders, slag carts, slag trucks, moulds, pots, forehearths, etc.

We are manufacturers under the patentees of the "Wright-McDougall" multiple deck-roasting furnace, the most successful and efficient roasting furnace on the market. Write for special descriptive pamphlet.

We have just issued our latest Smelting catalogue "Machinery and Equipment for the Smelting of Ores." If interested in smelting operations a request for the book will bring it to you.

Remember we are at your service to assist you in any way we can, our fifty years of successful business is our guarantee that we will treat you right. Command us.



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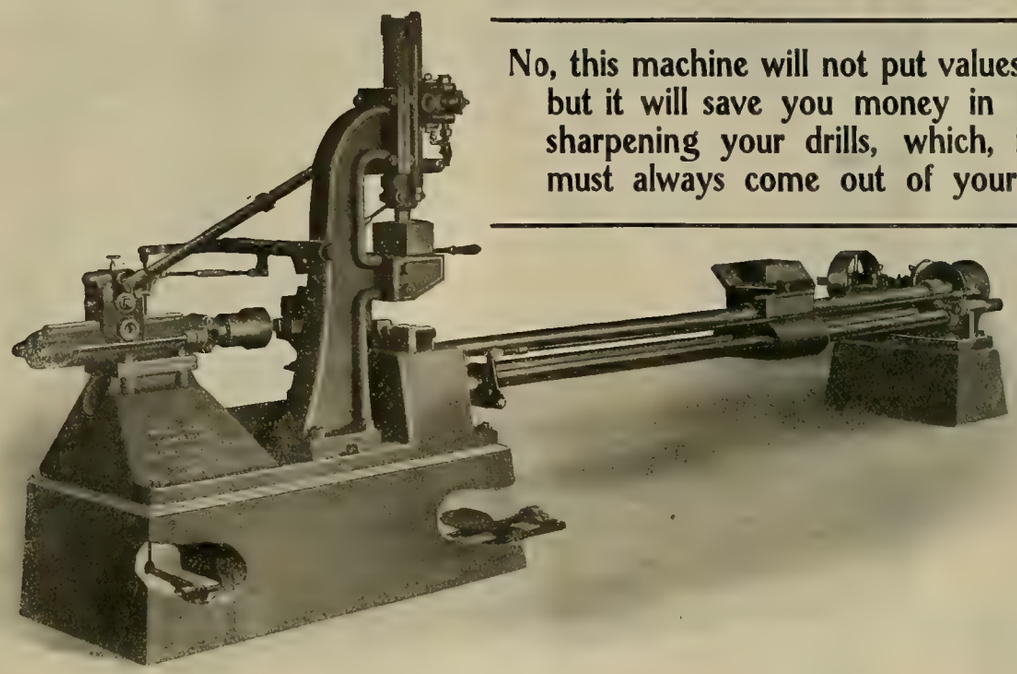
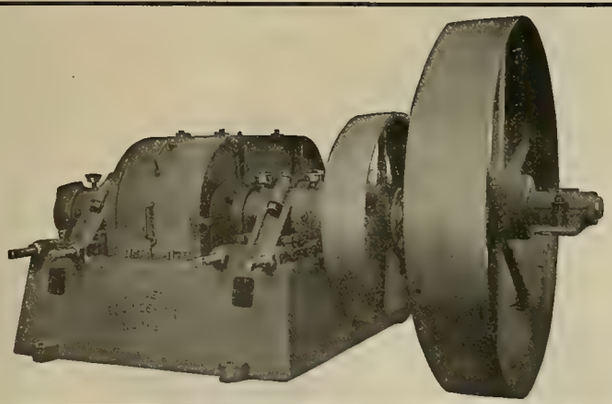
THE WORD BROS.'
Improved Drill Maker and Sharpener.



No, this machine will not put values in your ore, but it will save you money in forging and sharpening your drills, which, in the end, must always come out of your "clean-up."

The Compressed Air Machinery Co.
24-26 First St. and 25-27-29 Stevenson St., San Francisco, Cal.

DENVER ENGINEERING WORKS'
CRUSHING ROLLS WITHOUT SPRINGS.



NO SPRINGS equals NO OVERSIZE
NO OVERSIZE " MORE PRODUCT IN LESS TIME
MORE PRODUCT " MORE PROFIT

"Things move along so rapidly nowadays that people saying, 'It can't be done', are always being interrupted by somebody doing it." — PUCK.

STANDARD RECRUSHING ROLLS

There are NO SPRINGS on Machines used in Rolling Steel Plates and Rails; there are NO SPRINGS on Ore Crushers; there are NO SPRINGS on Steam Shovels; and the shocks and strains on these machines are far greater than on Crushing Rolls under any condition of operation. The keynote of successful design in these machines is combination of strength and simplicity. Both of these factors constitute the prime feature of our Springless, Standard Recrushing Rolls.

By doing away with the complication of spring rolls, we are able to offer at a low cost a machine which is better in every way than the spring rolls. You are not experimenting when you specify springless Recrushing Rolls; they have been thoroughly tried out in service and have proven their superiority in every way.

If you are interested on this subject, send for our Bulletin 1019.

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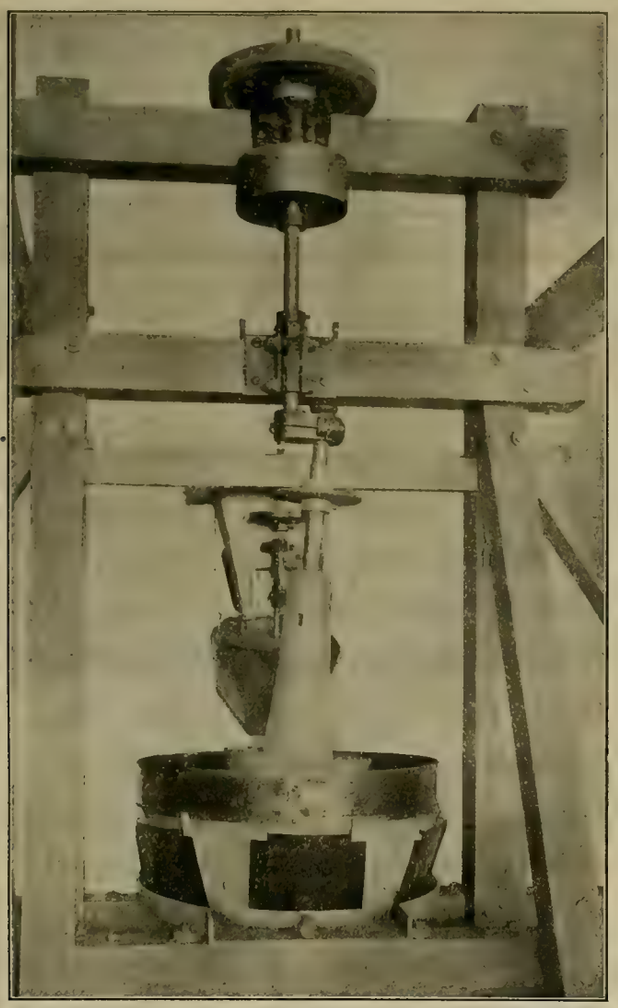

THE BEST WAY to Treat Slimes

is NOT TO MAKE THEM.

DO YOU KNOW that hundreds of thousands of tons of ore that defied concentration with the stamp mill have been successfully concentrated after being crushed in the KINKEAD MILL?

DO YOU KNOW that tens of thousands of dollars have been taken out of the waste dumps of the Bonanza Mines of the Comstock with this Mill: rock so low in value that it was used to grade the streets with?

DO YOU KNOW that thousands of tons of hard quartz from the lower levels of the Comstock have been and are being successfully treated by the Kinkead Mill to-day?

DOES IT INTEREST YOU TO KNOW that we are operating six mills and six concentrators with less than 20 Horse Power, and that as far as ease of installation, economy in power and wear, and in even quality of pulp delivered, is concerned, the Kinkead Mill is as far ahead of other mills as the Pullman car is ahead of the stage coach?

LASTLY, DO YOU REALIZE that crushing by percussion is wrong in principle, and that crushing by a pressure is the correct way?

IF YOU WANT TO KNOW MORE about what the Kinkead Mill can do, write us.

Henshaw, Bulkley & Co.,

Sole Agents for North and South America, Mexico and Central America,

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It's THE BEST

(and WE make them.)

The above picture shows one of our Traction Engine outfits in use in Nicaragua, C. A.; was used during late war by that Government for transportation of troops and supplies. Engine, 110 H. P.; car capacity, 16 tons each. Can be used on from 5 to 30 per cent grades, depending upon conditions of roads. Over 150 in use on this coast alone, and every one a money maker. Let us know the kind of freight you are hauling, per cent of the grades, usual conditions of roads, and we will tell you how to save ⅓ to ½ of your present cost of hauling.

Write for our new Catalogue No. 18, and we'll do the rest.

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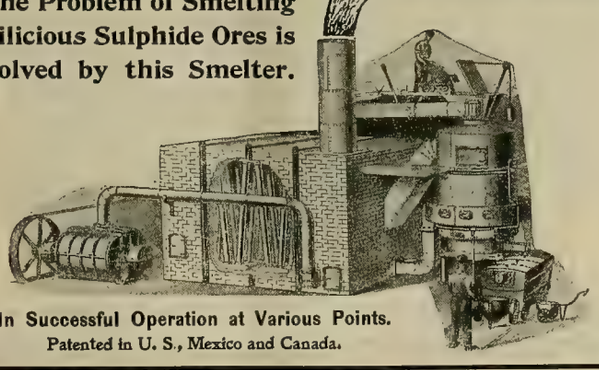
A SUCCESSFUL SULPHIDE SMELTER

The Problem of Smelting Silicious Sulphide Ores is Solved by this Smelter.



In Successful Operation at Various Points.
Patented in U. S., Mexico and Canada.

The MacDonald Smelter

SAVES THE PRECIOUS METAL VALUE AT LOW COST.

Especially Designed for Silicious Sulphide Ores Carrying Gold, Silver and Copper Values. Very Successful.

This Smelter is no experiment, having been in continuous and successful operation for nearly three years in Mexico on complex and refractory sulphide ore of low value. First a 40-ton plant was erected at El Oro, then two 60-ton Smelters, and in September, 1904, a 150-ton plant was put in operation and another 150-ton Smelter is being added. Metallurgists who have visited and inspected the Smelters in operation in Mexico report that they are doing more than we claim for them. One of our 60-ton outfits is now erected near Valardena, Mexico, by a Chicago company. A second Smelter of larger size is also contracted for.

DESCRIPTIVE MATTER COVERING EVERY POINT ON APPLICATION.

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C. W. MUNSON, Manager. TOLEDO, OHIO.

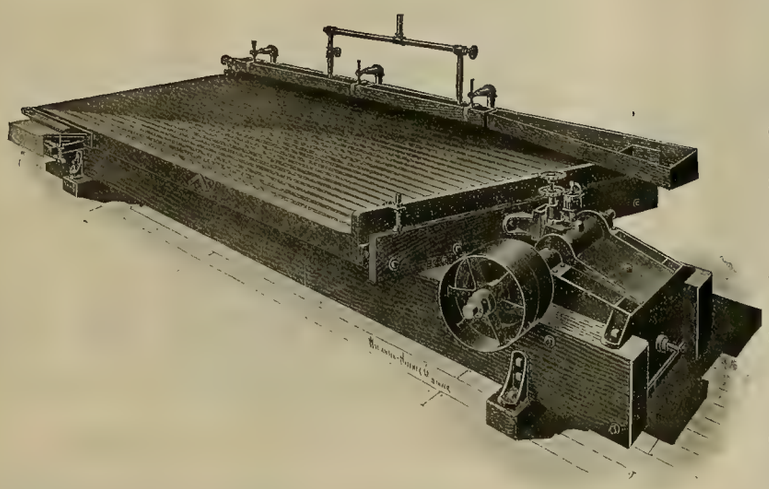
THE PIONEER MINING MACHINERY HOUSE OF THE WEST.

THE HENDRIE & BOLTHOFF MFG. AND SUPPLY CO.

DENVER, COLO.

STEAM ELECTRICAL AND HYDRAULIC ENGINEERING — MINE AND SMELTER SUPPLIES.

THE CARD CONCENTRATING TABLE



Is Absolute Simplicity

The volume of favorable comment that we have received during the past few months from millmen is proof positive that the Card has filled the demand for an absolutely reliable table. It's the concentrator of the present as well as the future.

It has capacity as well as the saving qualities, a good combination.

Wonder Air Hammer Rock Drills

"THE ORIGINAL PNEUMATIC HAMMER DRILLS AS APPLIED TO ROCK MINING."

The Little Wonder Side Valve Drill

THE WONDER DRILL is a money saver, from the fact that it cuts more rock in comparison with the amount of air consumed than any drill you can purchase.

Hundreds of practical mine operators pronounce it a success, therefore you are running no risk whatever.

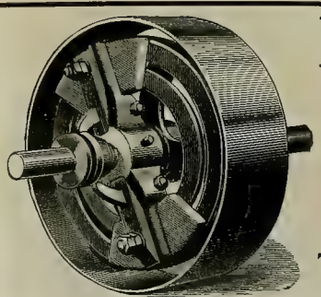
"The proof of the pudding is the eating."

Give us an opportunity to demonstrate the possibilities of the Wonder drill to you.

Write at Once for New Catalog.

HARDSOGG WONDER DRILL CO.

OTTUMWA, IOWA, U. S. A.



Friction Clutches

FOR EVERY KIND OF SERVICE.

CLUTCHES which take hold.
CLUTCHES which let go.
CLUTCHES which give no trouble.
CLUTCHES with ample strength.
CLUTCHES that are not overrated.

Manufactured by

The Eastern Machinery Co.

NEW HAVEN, CONN.

SPECIALISTS IN LOCOMOTIVES

We've been building them for a third of a century, paying particular attention to the types of locomotives required for engineering and mining operations.

The illustration shows a **SHAY GEARED LOCOMOTIVE,** winner of the **Gold Medal** at the Louisiana Purchase Exposition. Especially adapted for grades and curves.

We also build **Saddle-Tank and Mogul Locomotives,** and many other kinds of the direct-connected type. Send for catalogues Nos. 10 & 13 containing details.

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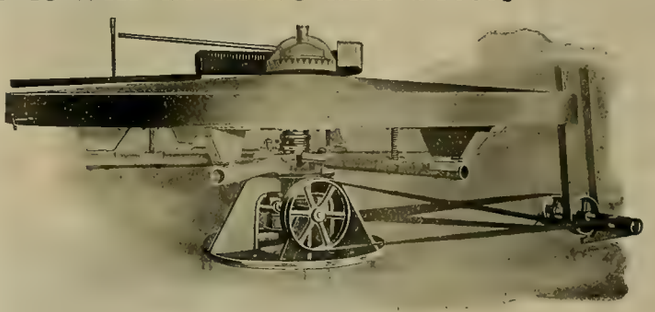

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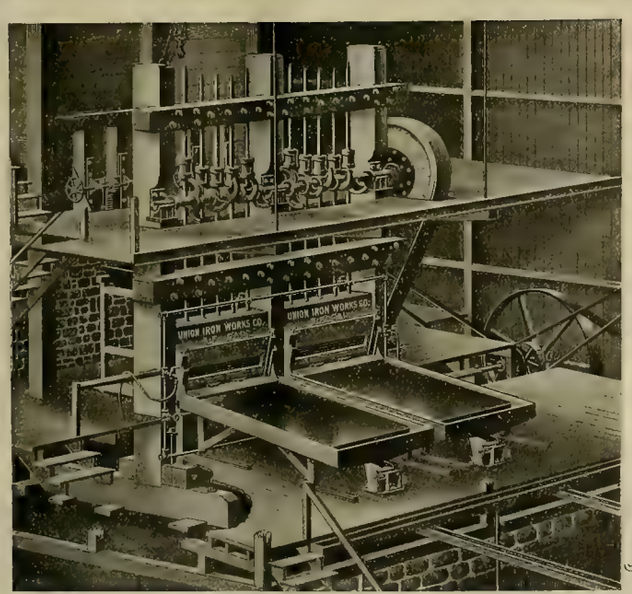

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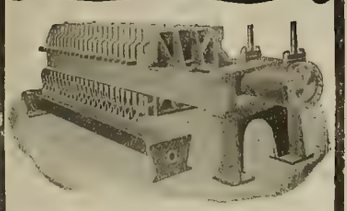

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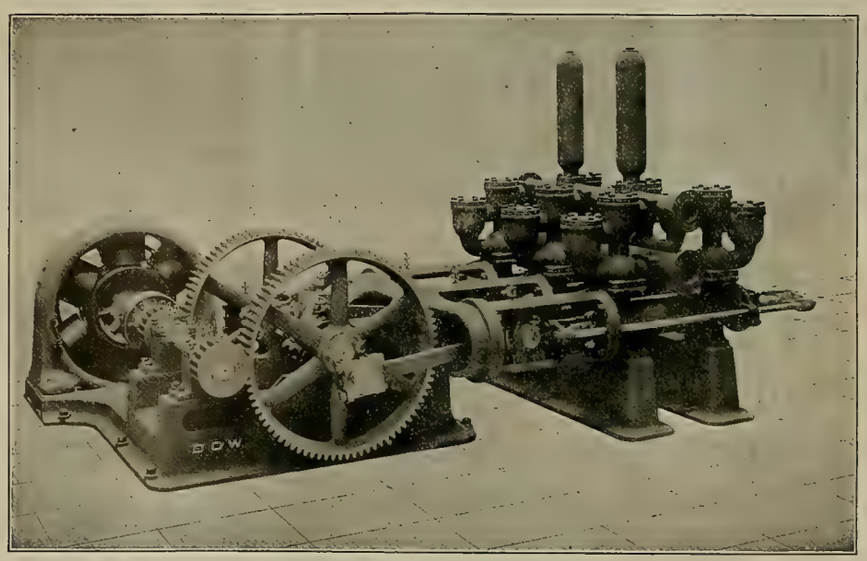

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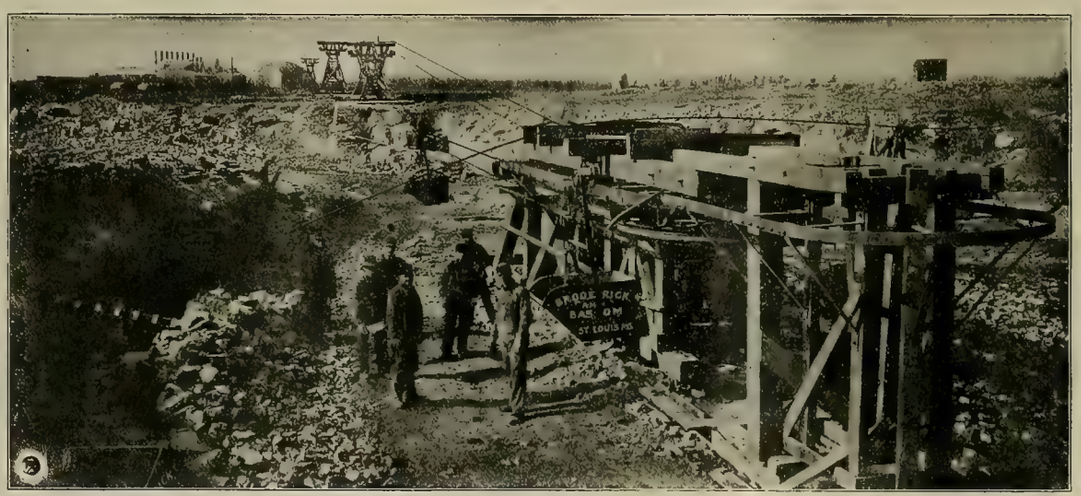

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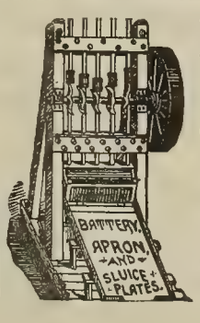

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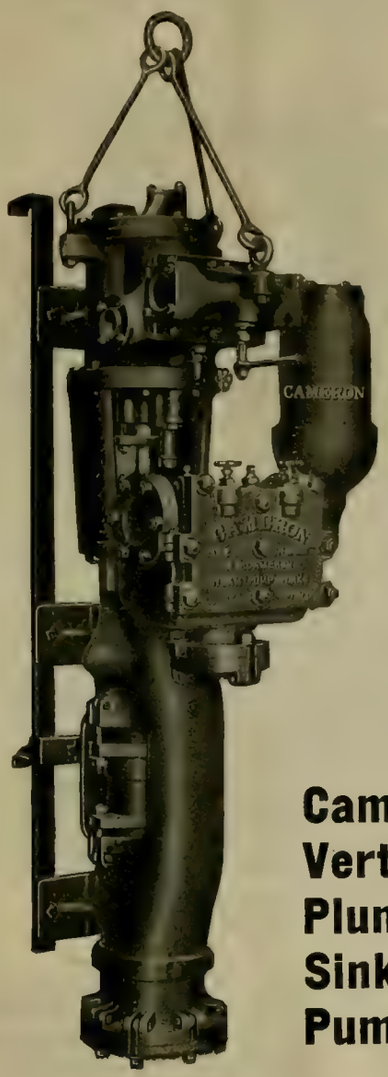

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Robt. A. Kinzie, Supt.

Office of

Alaska Treadwell Gold Mining Co.

File No. 46

Subject: Inquiries.

Main Office Mills Building San Francisco, Cal.

Treadwell, Alaska, November 2, 1905.

A. S. Cameron Steam Pump Works,
Foot of East 23d Street,
New York City, U. S. A.

Dear Sirs:

With regard to your letter of October 19th, you perhaps know that we handle very little water and most of this comes from the shafts in the process of sinking, and from our open works.

At present we are using in the Treadwell mine, two No. 5 and two No. 7 Sinking Pumps and two No. 7 Station Pumps. At the Mexican mine we are using two No. 5 Sinking Pumps and at the Ready Bullion mine, two No. 5 Sinking Pumps and one No. 7 Station Pump, and at the 700 Foot mine, one No. 5 Sinking Pump.

All the above pumps are giving satisfaction in the places used. If we knew of any better pumps we would certainly get them.

Yours truly,
ALASKA TREADWELL GOLD MINING CO.
By Robt. A. Kinzie.
General Superintendent

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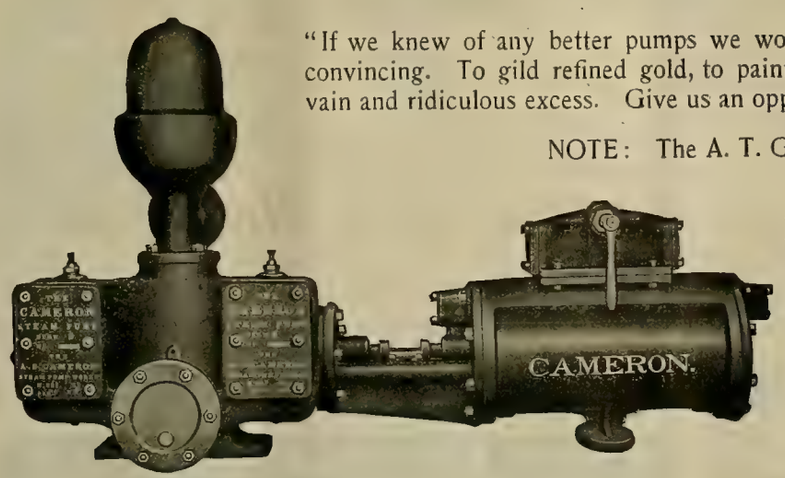

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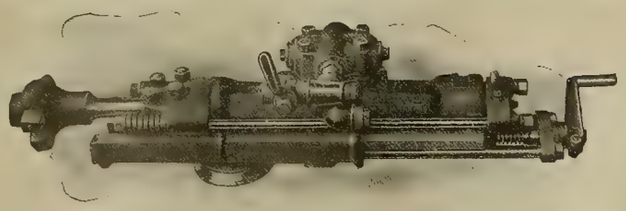

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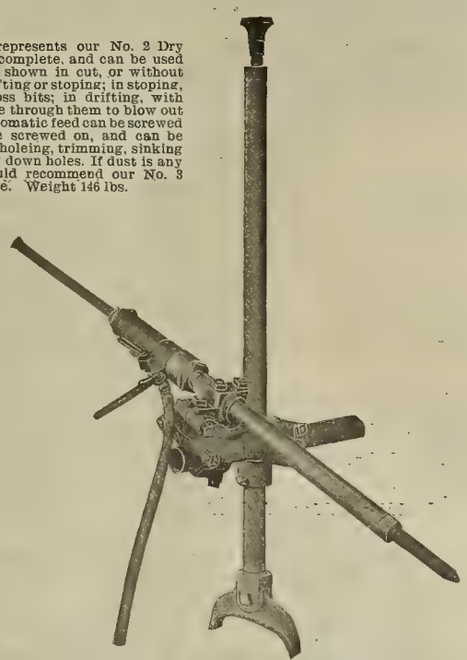

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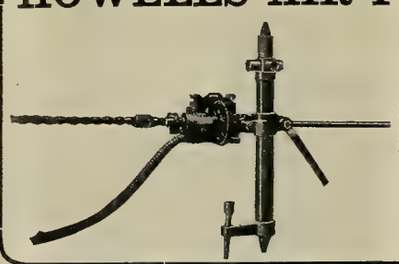

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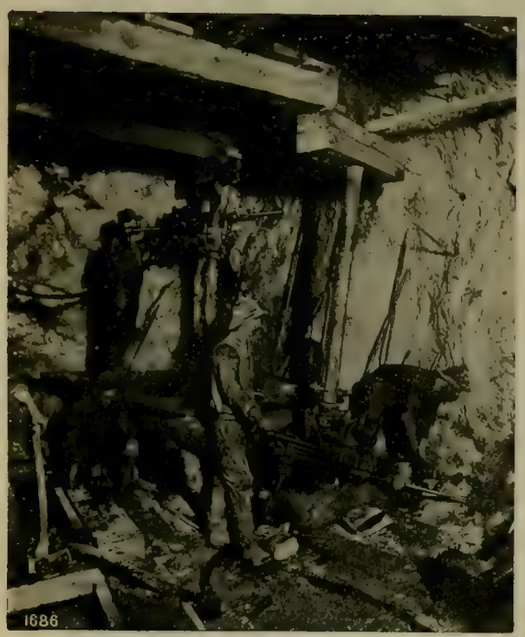

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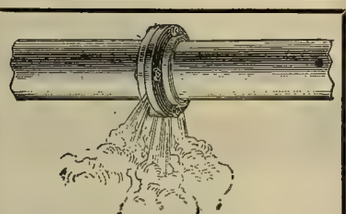

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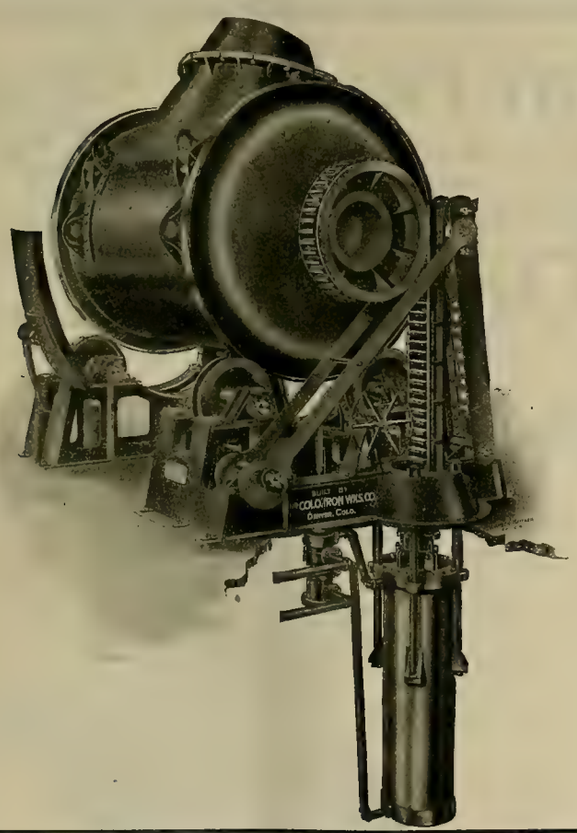

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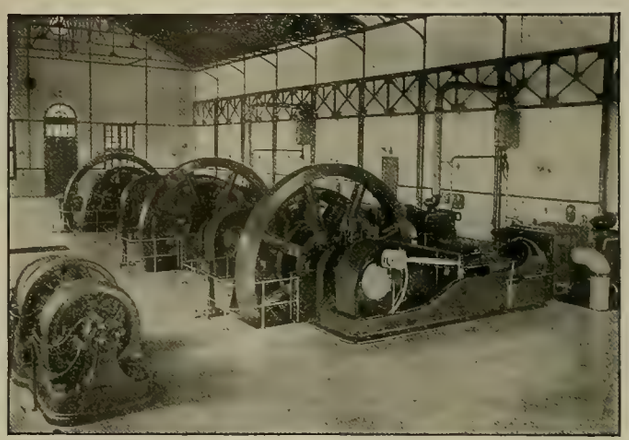

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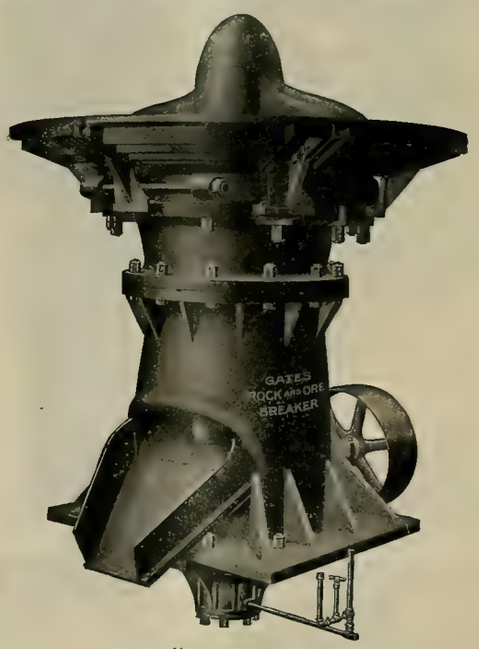

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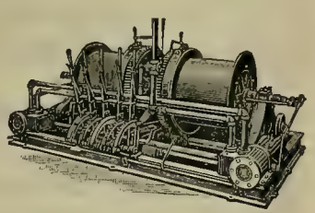

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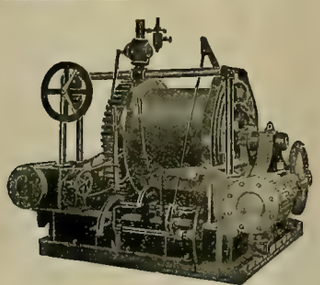

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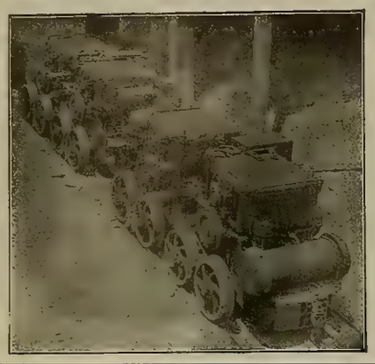

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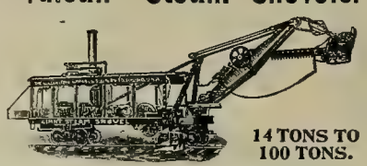

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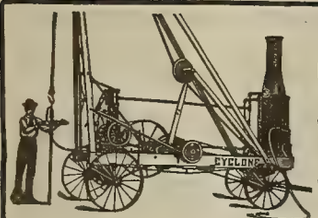

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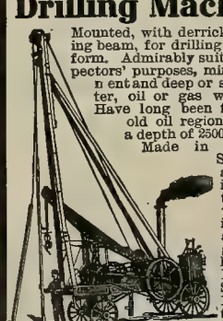

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THE CALIFORNIA DEBRIS COMMISSION having received applications to mine by hydraulic process from E. Baker, A. R. Merrithew and C A. Simons, in Good Luck Mine, near Gold Run, Placer County, Cal., draining into Squires Creek; from E. P. Gallagher, in Gallagher Mine, near Columbia, Tuolumne County, Cal., draining into fiume of Tuolumne Water & Electric Power Co.; and from Thos. C. Mayon, F. M. Clark and W. D. Clark, in Clark Mayon Gravel Mine, near Oleta, Amador County, Cal., draining into Amador Creek, gives notice that a meeting to receive any protests will be held at Room 68, Flood Building, San Francisco, Cal., Jan. 15, 1906, at 1:30 P. M.

THE CALIFORNIA DEBRIS COMMISSION having received applications to mine by hydraulic process from Harvey S. Drake, in Burgstresser Mine, near Strawberry Valley, Yuba County, Cal., draining into Pinkard Creek; and from W. F. Mills, in Horse Valley Placer Mine, near Camptonville, Yuba County, Cal., draining into Horse Valley Creek, gives notice that a meeting to receive any protests will be held at Room 68, Flood Building, San Francisco, Cal., Jan. 8, 1906, at 1:30 P. M.

THE CALIFORNIA DEBRIS COMMISSION having received application to mine by hydraulic process from Ah Jip and Ah See in Secret Diggings Mine, near Laporte, Plumas County, Cal., draining into Slate Creek, gives notice that a meeting to receive any protests will be held at Room 68 Flood Building, San Francisco, Cal., Jan. 22, 1906, at 1:30 P. M.

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SAN FRANCISCO, JANUARY 6, 1906.

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Preface.

To the Readers of the Mining and Scientific Press.—In taking editorial and business control of a paper so well established in the esteem of a large and widely scattered constituency, I feel the obligation due to those who have supported it in the past. It is my intention to maintain those features which have won deserved approval, and more particularly to observe the abstinence from malice and the fairness of criticism that have characterized its editorial comments during recent years.

In these days of quick achievement and passing reputation, it is no slight thing to succeed to the direction of a technical journal that is forty-five years old. Forty-five years in California goes back almost to the beginning of that complex method of life we call civilization; it marks the time when technical science commenced to give a helping hand to the energy and muscle of the pioneer; when the ancient and venerable rule of thumb became displaced by the logical methods of the engineer.

It is proper that a periodical devoted largely to the technology of the precious metals should be published in a State, the romantic story of which marks the dawn of that industrial development which has conquered a continent and consolidated a great people. It is fitting that the oldest mining paper in America should hail from San Francisco, where the westward wave of Empire rolled back and the foot of the Anglo-Saxon halted, after many wanderings, to make a country, the natural beauty of which should become the synonym for a happy home, a garden for the invalid, a rest-house for the worker.

San Francisco was a proper place of issue for such a journal, and more assuredly it is today the place for similar work. Not only is the whole mining region of the Sierra Nevada tributary to the City of the Golden Gate, but the railroad has knitted close the bonds that tie her to British Columbia in the north, to Arizona and New Mexico in the south, and in the east to the great Rocky Mountain States of Idaho, Montana, the Dakotas, Wyoming and Colorado. Furthermore, being the gateway of the Pacific, she has her ships that go up and down, from the Arctic goldfields in Alaska to the Tropic wealth of Mexico. San Francisco is the distributing point for a mining territory wider than any other where life and happiness meet.

Since May 24, 1860, when the MINING AND SCIENTIFIC PRESS was founded, the art of mining has grown beyond recognition; fundamentally it is the same, but it has made alliance with so many younger sciences that its homely features have been transformed. The plain digging for gold in the gravel of the stream, or the search for it in the quartz upon the hillside, has of necessity become a complicated process, requiring a trained intelligence and complex machinery, guided by the best that human understanding has evolved from thought and experience. The old energy and common sense are more necessary than ever, but when the miner once began to go deep below the surface and to extract the metal from minerals of complex composition, he had perforce to ask for all the help that Art and Science could give. As his needs have grown, so has the source of his help. The muscular metallurgy of the 'long tom' and the rocker, of the arrastra and the stamp, gave place to the physical chemistry of processes dependent upon advanced research; the plain mineralogy of the hammer and blowpipe was succeeded by structural geology and accurate surveys the immediate value of which has been incalculable.

In Europe a similar development occupied 500 years, in the West it required 50. Necessarily, there was much waste of money; there was a more regrettable loss of experience. Men made experiments which others had tried in vain, they repeated the blunders of their predecessors, nay, even of their contemporaries, simply because there was no method of recording them usefully. It is the mission of technical papers such as the MINING AND SCIENTIFIC PRESS to remedy this failing by affording an opportunity for thoughtful men to compare notes, to give information concerning their own work, whether successful or not, so that others may profit, and having profited, give a return in kind, by stating what they also have done. And beyond the mere interchange of data concerning current practice, such a paper as this ought to help in the crystallization of professional ethics and it should serve as a stimulant to that solidarity and *esprit de corps* which are essential to the engineering profession if it is to take its proper place in the world of today.

I confess to having but little liking for the mere manufacture of periodical literature designed as a lure for advertisements. The technical journal must have a better mission if it is to survive the present period of speculative publishing; on the contrary, I firmly believe that a paper which arouses the interest and stimulates the thought of technical men will receive such measure of support from them that those also who sell machinery will find it a remunerative vehicle for the offer of their merchandise. Therefore, the only test to which contributions will be put, is their interest and usefulness to the reader. While compression of language and conciseness of style is desirable in writing that deals with science and business, it does not seem to me that such writing should necessarily be made unattractive or that the human aspect of technical progress should be always eliminated. Man needs not only chunks of knowledge, like portions of solid meat, but also some of the garnishing to help assimilation and to prevent mental dyspepsia.

While I have a comrade's regard for the professional men who direct mining and smelting operations, I have also cordial respect, bred of intimate acquaintance, for the superintendents and foremen that actually carry out the work. The man behind the gun—in mining—is the shiftboss. I trust I may never write anything that a shiftboss, who cares to understand, cannot understand; and beyond such chiefs among the workers, I hope to meet the intelligence of all those that want to learn or care to discuss the ideas that underlie the arts of mining, milling, and smelting.

In the last issue of 1905, my predecessor in the control of this paper, and my friend, spoke of the transfer in terms that were an honor not lightly to be forgotten. I am glad to say that the name of Halloran will still be associated with the MINING AND SCIENTIFIC PRESS, for Arthur H. Halloran, the son, will remain on the editorial staff. D'Arcy Weatherbe, of Halifax, Nova Scotia, will join him within a month. The business department will be in the entire charge of Edgar Rickard, my cousin and formerly my professional associate. His knowledge of machinery, of the people that make it and the men that use it, will be invaluable. Neither he nor I shall practice our profession as mining engineers nor engage in mine promoting of any sort. It will be our ambition to win the aid and to deserve the support of those that are engaged in mining, smelting and the allied occupations, in the West first, and in the English-speaking world afterward. To such men we appeal with confidence for help in making the MINING AND SCIENTIFIC PRESS useful, to the betterment of practice, to the saving of experience and to the advancement of knowledge in its widest sense.

January 1, 1906. T. A. RICKARD.

EVERY improvement in the mail service is a distinct gain to the business world. The new mail trains going east from San Francisco connect at Omaha with express trains for Chicago and New York so as to carry letters from one coast to the other (3,500 miles) in 87½ hours, instead of the 103 hours formerly consumed in transit. A letter can be sent and a reply received within a few hours over a week. This arrangement is the result of negotiations carried on for several years between the officials of the railroads concerned.

THE management of the North Star Mines Company at Grass Valley observes a pleasant function each Christmas, holding a general gathering of its employees and presenting each one with a token of goodwill. This time miners received $10 apiece and the less skilled workmen $5 each. Those who injured their boots in the recent fire were presented with a new pair. The singing of carols and the making of friendly speeches gave an air of good-fellowship to the gathering such as goes far to establish the right relations between the staff and the employees. "Man's inhumanity to man" is the cause of one-half the labor troubles of the present day, and the North Star Mines Company is to be congratulated upon having established — and maintaining — a feeling of co-operation and kindness among the officers and men on its payroll.

BUSINESS houses at Guaymas report that they are suffering from interruptions caused by depredations of the Yaqui Indians in the State of Sonora, Mexico. The transport of merchandise has to be made by roundabout trails in order to avoid collision, and the general lack of security tends to interfere with industrial activity.

IN consequence of the rapid development of mines producing silicious ore, such as those at El Oro, Pachuca and Guanajuato, it is difficult for the Mexican smelters to procure a suitable fluxing mixture. As a result there is a tendency to return to the German practice, best typified by Mansfield, and to substitute the old Rachette furnace with brick lining in place of the water-jacket. The water-jacket robs the tuyere zone of 15 to 20 per cent of its heat, and it has become evident that if this heat, now lost, can be utilized, the silica can be raised to a tri-silicate condition. The formation of bi-silicate slags has not been accompanied by large losses, even with a small matte-fall, so that this new development promises to be of general benefit to the smelter and to the miner.

THE announcement made recently by the new British Premier that the importation of Chinese into the Rand will be stopped, is bound to have a most depressing effect on the mining industry of South Africa. Quotations on the Exchange have fallen, but not so much as might have been anticipated, simply because they have been drooping steadily ever since the termination of the Boer war and have now reached a point where business is almost at a standstill. The plan of introducing the coolies under indenture has added 45,000 to the laborers on the Rand, but it has not afforded the number required for all the enterprises under way. In the meantime this method of aiding mining activity has created a nasty political question in which the British Parliamentary parties have taken sides. This means an uncertainty deadly to confidence in South African mining investments, for with each change of party government the matter comes up for review and adjustment. While the production of gold will continue, and increase, despite these obstacles, the general effect is to cause investors to turn from South Africa to other countries, where the labor problem is solved, or has not yet come up for solution.

AMERICAN capital and energy are finding a profitable field in Mexico. In applying these motive forces to the development of the southern Republic, our countrymen are receiving hospitable treatment and kindly consideration at the hands of the native people; nevertheless, the traditions of the home land are strong and there is a disposition to form social communities of their own in the midst of the foreign life that environs them. It is pleasant to note how the technical men at such places as El Oro and Guanajuato interchange courtesies and meet for purposes of business or sport without those petty jealousies which often spoil the life of a mining camp. The American engineers maintain the solidarity of their profession and the Englishmen are just sufficiently numerous to sandwich a little healthy outdoor sport between the labors of the mine and mill. At Guanajuato there is a technical society, recruited from the staffs of the various mines, which meets every Saturday evening; it would be difficult to exaggerate the usefulness of such an organization in promoting exchange of ideas and mutual helpfulness. The Guanajuatenses had a flood that made their town celebrated, but more recently they were threatened by a social earthquake when they were promised the appointment of a colored gentleman as consular agent. The assimilative capacity of small Anglo-American communities in this regard is decidedly limited, and when a town has for representative of the American Government so honorable and capable a man as Mr. Dwight Furness, it is not to be wondered that trouble seemed imminent. However, that danger has, we understand, been passed and the business of Guanajuato will proceed on its even way. Good work is being done at El Oro and Guanajuato; some of the most capable men in the profession are there, and they are fortunate in being able to apply their skill to splendid mines and to metallurgical problems of the most fascinating kind. We wish them every success in 1906 and after. *Con Dios vayan ustedes, mis amigos.*

Cyanidation of Silver.

On another page we publish an article on the treatment of silver ore by the cyanide process and in subsequent issues we shall afford our readers further information on this subject. It is curious how long the successful treatment of silver ore has been delayed, pending the pursuit of economy in the extraction of gold. In its early days, it was claimed that potassium cyanide could extract both of the precious metals equally well, but the results of practice negatived the assertion. Within the last two years Griffiths, Oldfield and Oxnam at Palmarejo, and Hamilton, Hobson and MacDonald at Guanajuato, have experimented so successfully on silicious ore containing silver in sulphide form that the process has become established as an economic success. It appears that while the employment of extremely weak solutions of potassium (or sodium) cyanide is beneficial to the reduction of gold ores, it was prejudicial to the silver, and recent success is largely due to the recognition of the necessity for stronger solutions and more time, conditions which in themselves illustrate the selective activity of the chemical. Experiments on a large scale have demonstrated that even a vanner concentrate, containing silver sulphide associated with pyrite, is amenable to profitable treatment. This is something that was tried in vain less than fifteen years ago.

The Mexican Peso.

There has been much confusion, some of it costly, by reason of the use of the term 'dollar' in Mexico. Those who live in our neighbor Republic are apt to forget to prefix the adjective which indicates that they are writing in terms of Mexican currency, and only recently the costs of cyaniding at Palmarejo astounded a foreign metallurgist who did not recognize the fact that the author was dealing with a depreciated coinage. Most of us who have felt astonishment at the output of the old mines have been relieved to find that we could divide the statistics by two, in order to bring them to our own basis of comparison. It is tiresome to be always writing 'Mexican' after the figures giving prices, outputs, or dividends of mines in the country of Diaz; therefore the word is apt to be omitted, to the frequent confusion of those who are not alive to the omission.

All this is now changed. By a recent law the word 'peso' becomes the proper word for the unit of Mexican currency and there is no longer any excuse for using that of the United States. The new law reads:

"The theoretical unit of the monetary system of the United Mexican States is represented by 75 centigrams of pure gold and is denominated a 'peso.'

"The silver 'peso' which has hitherto been coined with 24.4388 grams of pure silver will have, on the conditions provided by this law, a legal value equivalent to the said 75 centigrams of pure gold.

"The alloy of the silver coins will be: For the 'peso' 0.9027 of pure silver and 0.0973 of copper; and for pieces of less value 0.800 of silver and 0.200 of copper."

Hereafter the 'dollar' and the 'peso' will have their respective duties, and anyone speaking of "Mexican dollars" will do so at their risk. It is a fact that a check made out in Mexico City for so many 'dollars' was paid by the bank at the rate of exchange for American dollars, or twice as much as the signatory of the check intended. On appeal to the courts, he lost; and thereby learnt a lesson from which others have taken warning.

The MINING AND SCIENTIFIC PRESS will be careful to employ 'peso' in all statements dealing with Mexican currency, and it will do its utmost to prevent a confusion (with the American dollar) which has been a standing nuisance so long.

In this connection we publish a conversion table for measures of silver. Among those who take an interest in Mexican mining are men of many nationalities, to whom the 'pound sterling,' the 'dollar' and the 'peso' are terms requiring conversion, when writing concerning the value of silver, whether as bullion or in the ore. The table gives the equivalents for the Troy ounce and the metric kilogram for silver prices ranging between 50 and 70 cents, a minimum and maximum not likely to be exceeded for some time to come. We hope the table will prove of service.

Gold and Silver Production.

On another page we give the preliminary statistics for the gold and silver produced by the States and Territories during the year just ended. The United States, as a whole, exhibits an increase, slight in the case of silver, but noteworthy ($6,000,000) as regards gold. This advance is due mainly to Alaska, where the Tanana district has yielded $5,107,000, exceeding the output of Nome and making it one of our premier goldfields. Colorado more than holds her own, by reason of the continued productiveness of Cripple Creek. Despite the activity in dredging, California exhibits a small decrease, due mainly to the drought, which curtailed milling operations. Utah and Nevada show progress. The silver statistics indicate that Colorado is losing ground slowly by reason of the exhaustion of the old mines at Leadville, while Montana is getting the benefit of the tremendous activity at Butte, where silver is produced as a by-product in copper mining. The ascendancy held by Colorado ever since the discovery of Leadville has now passed to Montana. Utah's production is steady, by reason of the continued prosperity of the big mines at Park City. Idaho has increased her silver output, in consequence of the greater yield from the lead mines of the Cœur d'Alene. In general, these preliminary figures indicate the healthy condition of precious-metal mining in the United States. Silver mining has benefited directly from the better market for that metal, the price averaging 61 cents for the year, but the indirect stimulus to both the mining of gold and silver by reason of the rise in the value of both copper and lead has been the dominant factor in increasing mining activity throughout the country.

Engineers and Geologists.

It is our intention to encourage discussions on matters appertaining to the work of the miner, millman and smelter. A department, on the fourth page, will be kept for this particular purpose. This week the only contribution is one dealing with a subject which has been much to the front during the last two years. The letter on 'Mining Engineers and Geologists' is written by a contributor for whom we have the highest regard; we have also a good deal of sympathy for his point of view, without endorsing it entirely. Engineers who dabble in geology have made sad messes occasionally, as have geologists who ventured to appraise mines; but we deprecate anything like antagonism between men who ought to be united by their avowed purpose, the ascertainment of truth. Some day we may have men who combine both geological training and mining experience; indeed, if we are rightly informed, several such are already available. They stand between science and industry, combining the knowledge essential to both, as the architect stands between the artist and the building-contractor.

As regards mining, a geological investigation which is divorced from sampling or the knowledge of the commercial value of the parts of an ore deposit, is, of course, useless to the investor. It is magnificent, perhaps, but it is not business. Similarly, there are mines in which geological structure, particularly faulting, plays so important a part in determining the distribution of ore, that the sampling of the stopes and levels, without an eye to the geological facts, is likely to be futile, as an appraisement of the value of a mining investment. The first duty of a technical man is to learn what he does not know—a wide field of knowledge, you may say, but it is a fruitful one. Then, when he meets with conditions beyond his ken, let him say so—to himself; occasionally to his client, if he is the right kind of man. There are many mine examinations which to be correct diagnoses require the combined work of the engineer and the geologist. The larger financial houses and the big mine-operators know this. We are among those who welcome the tendency for large mines to engage the occasional special service of a trained geologist, just as we like to see them utilize the services of expert metallurgists to solve special problems. We hold, however, that men devoted to science and unacquainted with business are rarely safe guides in an affair such as the valuation of a mine, because it is work which demands the experience obtained in the actual management of mines. An artist is not a fit valuer of a building, much less of a building site.

CONCENTRATES.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

CRYOLITE is a fluoride of sodium and aluminum. It contains aluminum 12.8%, sodium 32.8%, fluorine 54.4%.

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OPALS have been found at several places in Idaho, mostly in trachyte, the best coming from Panther creek, in Lemhi county.

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THE diatoms in infusorial earth are very minute, and can only be seen by the aid of the microscope. They present many forms, some of which are very beautiful.

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SMALL ore deposits often accompany intrusive feldspathic veins, in metamorphic rocks. Usually these bunches of ore are of limited extent, and, though rich in metal, are of little value.

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PLACER gold is usually not worth over $18.50 per troy ounce. The gold from the placers of Juarez, Lower California, however, is worth over $20 per ounce, being almost free from impurities and unalloyed with other metals.

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A BELT conveyor about 250 feet in length is used to transport ore from one of the shafts at the Homestake mine to the nearest mill. At other shafts the ore is sent to the mills in trains drawn by compressed air locomotives.

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GOLD was first discovered at Leadville, Colo. (then called Oro City), in 1860. It was not until 1876 that it was recognized that the heavy boulders and sand, which had been the bane of the placer miners, was lead carbonate rich in silver.

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A WELL boring outfit is the best thing to employ to sink through gravel. In this process casing is driven to prevent caving of the hole. When bedrock is reached if it is desired to prospect deeper the diamond drill may be substituted to advantage.

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IN some regions where greenstone schists predominate, the country is cut in every direction by white quartz veins showing no mineralization. It is seldom that veins of this character are gold-bearing, though in the same region there may be fissure veins containing pay ore.

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'CONCENTRATES' knows of no mineral assaying 20% aluminum and 17.77% oxygen. The remaining constituents of the mineral are not stated. The minerals containing aluminum which are of commercial value carry 50% or more of aluminum. Among these are bauxite and corundum.

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THE first recorded discovery of bauxite in the United States was made near Rome, Georgia, in 1887, though the first production of that mineral was from deposits at Hermitage, in Floyd county, Georgia, in 1889. Georgia and Arkansas are at present the principal producers of bauxite in the United States.

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TIMBERS for mine shafts should be selected with a view to both their strength and enduring qualities. Where the shaft is sunk on the vein it is nearly always Some kinds of rock require heavier timbers than others. advisable, if not necessary, to use heavier timbers than where the excavation is sunk in the country rock.

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THE hydraulic gravel elevator is used to work wet placer ground situated below the level of the surrounding drainage. It is also used in some localities to work ground, the head being artificial——produced by pumping. The situation and the value of the gravel must determine the method of mining to be adopted in each case.

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WHERE chalcopyrite or other copper sulphide ore occurs, disseminated in a mass of decayed rock, as in diorite or granite, the ore is usually a good concentrating material, and should be so treated unless occurring in sufficient abundance in the rock to make it economy to send it to the smelter direct without attempting hydraulic classification and mechanical concentration.

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WHERE work is done on an unpatented mining claim, by those holding a bond on such claim, this work may be considered as the annual assessment work, to the extent of $100 for each claim, but where the work is done by such parties after the expiration of the bond, the work cannot be counted as assessment work for the reason that they are as strangers, having no legal rights upon the ground. The work must be done by the claim owner, or be done at his instance.

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THE smoky quartz crystals for which Colorado is famous come from Pikes Peak, in a coarse granite. The large colorless transparent quartz crystals of California were all found in a small area in white rhyolite tuff in an ancient river channel in Calaveras county, about 1 mile south from Mokelumne Hill. It is supposed they came from a cave or pocket lined with these gigantic crystals, some of which weighed over 100 pounds, but the original source has not been discovered as far as known.

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TURQUOISE occurs in brecciated trachyte, in veinlets and small irregular masses. The stone is hydrous phosphate of alumina. The delicate blue color is due to the presence of a small amount of copper. Some varieties are green. These are not of value. In some blue kinds the color fades to a peculiar green, which destroys their value as gems. It is not an unknown practice to artificially treat very lightcolored and comparatively worthless varieties of turquoise to give them a better color, but this is not enduring.

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BY metamorphosing processes limestone is altered to a variety of rocks, principally silicates, the process being one of simple silicification. The silica originally present in the limestone, or infiltrating into it from ground waters, replaces the carbon dioxide and forms silicates. Where the original rock is pure limestone wollastonite forms. If the rock be dolomite, diopside or tremolite is the usual result of silicification. Garnet, tourmaline, hornfels, serpentine, olivine, pyroxene and other minerals also form from the silicification of limestone.

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THE gold content of amalgam can only be judged approximately by those familiar with that particular amalgam. The percentage of gold decreases with the fineness of the particles of gold. That which is very fine contains less gold per ounce than that where the golden grains are coarse. The amount of silver present is also a very important factor. Amalgam from the ores in different parts of the same mine, particularly if from different shoots, will vary considerably in value for a given weight. Ordinarily, hard squeezed amalgam will contain from 25 to 35 per cent of its weight in gold, but the amount varies greatly.

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A CITIZEN of the United States may locate as many claims on one lode as he cares to perform the assessment work on, and he may re-locate as many claims abandoned by others as he may find, either on one lode or on several lodes. No claim can be located by a stranger on agricultural ground, and the owner of an agricultural patent is not required to locate a vein or lode which he may discover on his own land, but he has no rights beyond the vertical boundaries of his property. Before a patent issues for a placer claim, the land department requires that proof, consisting of the affidavits of two or more witnesses, should be filed showing that there are no known lodes, or veins, within the tract applied for. This is the law and it must be followed. No one can enter a patented placer location and locate a vein not known to exist before the application was made for the placer patent.

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THE question having been asked: "Where in the Western States is at present the best place to prospect during the next three months?" 'Concentrates' would suggest that southern Nevada and northwestern Arizona and southern California at present offer the best inducements to the prospector, for several reasons. First, there is a large area in that desert region not thoroughly prospected, owing to difficulties of transportation, and scarcity of water; the former is, however, being simplified by the construction of railroads, and the establishment of near towns and mining camps in that region from which the prospector may radiate with more safety than heretofore. Second, the ores are often high grade and can be shipped to distant points for reduction, rendering mills or other reduction works unnecessary. Third, any promising prospect in the region above referred to could readily be sold at a proper price, owing to the unusual interest at present being taken in the mining industry there. Fourth, it is the best part of the year to prospect in the desert, the weather being generally fine and water more abundant than during the summer months. Outfits can be bought at any of the larger towns in the region, which relieves the prospector of the necessity of packing tools, provisions, etc., into the mining region.

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CONCERNING a 'vein apex' the Supreme Court of the United States said in the Flagstaff case, Flagstaff v. Tarbet, 98 U. S. 463, No. 469. "We do not mean to say that a vein must necessarily crop out upon the surface in order that locations may be properly laid upon it. If it lies entirely beneath the surface and the course of its apex can be ascertained by sinking shafts at different points, such shafts may be adopted as indicating the position and course of the vein, and locations may be properly made on the surface above it so as to secure a right to the vein beneath. But where the vein does crop out along the surface, or is so slightly covered by foreign matter that the course of its apex can be ascertained by ordinary surface exploration, we think that the act of Congress requires that this course should be substantially followed in laying claims and locations upon it. Perhaps the law is not so perfect in this regard as it might be; perhaps the true course of a vein should correspond with its strike, or the line of a level run through it; but this can rarely be ascertained until considerable work has been done and after claims and locations have become fixed. The most practicable rule is to regard the course of the vein as that which is indicated by surface outcrop, or surface explorations and workings. It is on this line that claims will naturally be laid, whatever be the character of the surface, whether level or inclined.

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QUARRIES and mines are in many respects much alike. A mine is usually considered an underground excavation, while a quarry is open to the air and sunshine. Breaking rock for macadam in an open pit is essentially similar to breaking gold, or copper, or any other ore in open cuts, but quarrying proper generally requires that the stone be taken out in solid masses. Slate, for instance, is quarried in good-sized blocks, and split and trimmed afterward. Granite is quarried in blocks, often breaking in shapes approximately rectangular, but frequently it is taken from its place by what is known as channeling——that is, a continuous cut is made by means of channlling machines and the blocks broken out in any desired size from the large mass. In other quarries the 'feather and plug' method is employed, and in very large quarries great masses are split off from the main mass by what is known as the Knox system of blasting, which consists in drilling two holes to the depth of several feet, these holes being a few inches apart and directly on the line along which it is desired to fracture the rock. These holes are shot repeatedly with black powder which results in riving the granite block in the desired direction. Sandstone, marble and similar structural materials are quarried in much the same manner. Ores are broken down in great masses, the only regard paid to stratification or jointing planes being their effect on the quantity of ore which may be broken with a single shot, or series of shots. Massive rocks often break better than those that are stratified.

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THE advantages claimed for machine drills of small piston diameter (2 in. and 2¼ in.) is that they use smaller steel and consequently a smaller bit, the drill cuts faster and thus saves time in reaching a given depth. Smaller powder cartridges are also employed. These smaller machines are well adapted to medium hard ground where large charges of powder are not required. Should the rock require more than ordinary force in blasting, No. 1 powder containing 70% nitroglycerine may be used. This grade of powder has nearly 100% greater disrupting force than the ordinary No. 2 powder. It also has the advantage of having the explosive concentrated near the bottom of the hole, thus decreasing the tendency to blow off the collar of the hole, leaving a foot or more of drill hole, the time spent in drilling which may be thus wasted. This frequently happens where holes are overloaded with lower grades of powder. Under ordinary circumstances all of the powder should be in the lower half of the hole and none of it in the upper half, and the primer should be placed in the upper stick, and not near the bottom, which latter practice is likely to result in setting fire to the charge, which then generally burns instead of exploding, creating an unnecessarily large amount of gas. Large drills are to be preferred where the rock is very hard and tough, and where heavy blasting is desirable, as in large stopes and shaft excavation, where time saved rather than economy in cost is the chief object. Some engineers prefer hand work in shafts on the ground of economy, but where large capital is invested and the interest charge is consequently high, speed in work may prove more economical than lower cost per foot of work accomplished where the interest charge is not an important factor.

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CONCERNING cross veins or lodes the Federal statute, section 2336, says, "Where two or more veins cross each other, priority of title shall govern, and such prior location shall be entitled to all ore or mineral contained within the space of intersection; but the subsequent location shall have the right of way through the space of intersection for the purpose of convenient working of the mine. And where two or more veins unite, the oldest or prior location shall take the vein below the point of union, including the space of intersection." In reviewing the several important cases in various States arising from cross-lode litigation, Lindley on Mines says: "All courts now agree upon the following propositions: The grant to the senior locator is of all veins found within his location regardless of their course, and whether they were previously known to exist, or were blind and undiscovered. There is no limitation implied and the grant is exclusive. A junior cross-lode locator has no right to any ore found upon the cross-vein within the boundaries of a senior claim. 2. The owner of a junior tunnel-site cannot by means of a crosscut tunnel penetrate within the boundaries of a senior claim for any purpose." As to what rights of way the owners of junior located veins may have as against senior claimants where the veins intersect or cross, it may be said that all courts agree that where two veins cross on their dips, the senior takes all the ore in the space of vein intersection, and the junior has a right of way through the space. The same may be said of veins crossing on their strike or course where there is no surface conflict between the locations. But where there is a surface conflict, and there are cross-lodes and cross-locations, there is a disagreement. In Colorado and Montana the junior cross-lode claimant has a right to drift through the senior claim, following the cross-vein, yielding the ore encountered to the senior locator. In California and Arizona he has no such right. Until the Supreme Court of the United States finally approves one or the other of these views each State and Territory will be left to determine which of the two conflicting rules is best supported by logic and reason.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

MINING ENGINEERS AND GEOLOGISTS.

The Editor:

Sir—The old question has cropped up again. A distinguished geologist has recently crowned himself with a halo of self-approval and has pictured the poor engineer as an unadorned creature busy with the commonplace "questions of measurement and equipment"—dealing, as it were, in the chores of mining, while the other man is dispensing the refinements of the same art. Why cannot the so-styled 'mining geologist' recognize that all mining engineers of any reputation, while they do not specialize along geological lines, yet have by training and by experience in the mining field acquired geological information which they can, and do, apply in a practical way wherever geology enters into the practical considerations of mining?

Because the man of lesser technical education describes some porphyry intrusion in common mining parlance instead of using such language as "product of igneous magmatic emanations disbursed through fissures in the adjacent matrix," that does not disqualify him from the mining engineering profession, nor does it gainsay the possibility that the man of smaller words may have sound geological sense and geological experience as applied to mining. With all due respect to the splendid work that the professed scientist—particularly the geologists of the Survey—has done, I feel sure I am voicing the opinion of others of the profession when I say there is too much of a tendency in geologists of academic training and limited practical mining experience to put themselves on a pedestal and arrogate to themselves some peculiar quality through which one is supposed to be impressed with the idea that they alone are fitted to pass upon the merits of a mining undertaking, and that they by nature were intended to occupy the middle ground between the practical miner and the man of capital.

There are geologists, consulting geologists or mining geologists or whatever the style, who, combining the geological with the mining profession, go into print and illustrations *in report form* descriptive of a mine, with the design of passing upon geological questions pure and simple and with the idea of avoiding altogether the commercial question—the question of values and operating costs—and the question of profit and loss. It is a matter of fact and incontrovertible that these same reports are sometimes used in questionable promotions, in cases where a report dealing plainly with measurement and equipment, and concrete facts generally, would neither be published nor circulated in prospectus form. Further, the misuse of geological treatises in mine report form is not under the control of the geologist (no matter what may have been the original purport of such report) and a favorable expression concerning matters more or less superficial may become deceptive through the omission of any reference to the economic question. The irresponsible promoter is quick to make use of such a circumstance.

Mining engineers who are not afraid to meet the commercial question, and are not in the habit of avoiding references which may be inconvenient to the owner and promoter, can prevent the waste of money in explorations which are directed without any practical understanding of the *business* of mining, and they do not hesitate to stop the squandering of money where there is no hope of profitable return. To take one's theories into the mine and work them out in the mine, to supply the gauge of the sample, the assay-office, and the tape, to take into account the many other considerations equally important, to face the question of profit-and-loss without prejudice and without compromise, and finally, to give something more than an ambiguous expression to one's conclusions, is the thing that makes mining engineering respected as a profession.

In the judgment of many men who are doing important mining work it is of less importance to follow the "particular branch of geology pertaining to the laws of ore deposits" in any college than to enter into the practical considerations of mining, first and last. The 'mining geologist' with the halo would do well to come to considerations which have a much more practical bearing on the mining proposition as a whole than speculation as to the origin of the orebody and geological considerations which are so far beyond the intelligence of the mining engineer as to come within the particular domain of the 'mining geologist.' It is for him, not the mining engineer, to "awaken to the importance of the subject," and to realize that when he seeks to give theoretical considerations more prominence than the practical considerations, such as the sampling and estimation of ore, he is going on a false trail which leads him away from the essential commercial factors which are all-important to the man who is contemplating an investment in legitimate mining enterprises. There is such a thing as using the microscope too much and the telescope too little.

FORBES RICKARD.

Leadville, Colo., January 2, 1906.

Electricity vs. Compressed Air for Mine Operations.

By W. R. HULBERT.

Compressed air has been the recognized medium for the transmission of power in mines for a good many years, and its use for this purpose has been growing rapidly—so rapidly indeed that a large number of engineers and mine operators probably believe that no other power will be able to displace it. It is the intention of this article to dispute such a theory and to show how many and varied are the advantages which electricity presents over compressed air when used in mining.

Probably no one would care to contradict the statement that electricity is more economical to produce. The losses in modern electric generators have been brought to a minimum, while losses in air compressors, although greatly reduced within the last few years by two-stage machines, still form a comparatively large percentage of the total power.

It is in the transmission of the two mediums, however, that electricity presents its great superiority. The total losses in an electric circuit are represented by a drop in the potential of the line and seldom exceeds 1 or 2% in installations involving comparatively short distances. With compressed air installations, however, the transmission losses usually represent a large amount of power and increase at a rapid rate with the number of elbows, valves, and pipe-lengths which are used. There is no increased drop from the effect of sharp turns in electric installations, while with compressed air systems each elbow and valve represents, approximately, the addition of an entire length of pipe to the system. Beside this there is nearly always a large leakage and a great increase in the expense of installation, since wrought iron pipes, with the necessary valves and fittings, are an expensive proposition to instal and keep in repair.

One of the important advantages claimed for compressed air in mines is that the exhaust may be used for ventilation. Let us examine this carefully and see how much of an advantage it really is. In the first place I quote from the report of the Miners' Phthisis Commission of the Transvaal as follows: "The composition of compressed air, shown by analyses, has revealed the very great danger that attends the use of inferior oils (or oils of low flash point), for the lubricating of the air cylinders of the compressor engine. The analyses of the compressor air show that in some of the samples carbonic-oxide gas was present in sufficient quantity to be extremely dangerous to health." It will be seen from the above that while compressed air rock-drills undoubtedly ventilate the mine with their exhaust, yet the ventilation so obtained is apt to have a bad effect on the health of the workmen. Furthermore, ventilation obtained in this way is, to say the least, an expensive luxury; it means that air under 60 to 80-lb. pressure is allowed to escape into the mine, while, as a matter of fact, air under the pressure of a few ounces would do the work just as well and would be far better for the health of the miners. It is a well-known fact that the modern compressed air rock-drill does not use air expansively, in fact it is almost an impossibility for it to do so without freezing up the exhaust ports. This being the case, it means that air which has required a large amount of power to compress is being practically thrown away when it possesses a potential value represented by the amount of work which it would do if expanded to atmospheric pressure. A small electric blower, requiring less than one-thirtieth the power required to operate a 3-in. rock-drill, will effect all the ventilation which would be accomplished by the exhaust from the drill.

Aside from the fact that an electric rock-drill does not waste a large amount of power on so-called ventilation, it possesses advantages in the way of lighting, it being possible to connect incandescent lamps to the circuit which is furnishing power to the drill.

Another drawback to the compressed air-drill, and one which is probably least understood, is the fact that it requires increased power to compress, at an altitude, an amount of air which will be equivalent in effect to a given amount at sea level, this increase averaging about 2% for each 1,000 feet of altitude. This is an item that ought to appeal to owners and operators of Western mines, which are usually situated at high altitudes, and provides an excellent argument for the use of electrically operated rock-drills.

In general, it may be said that a 3½-in. electric drill will only consume from 2½ to 3 h. p. against 15 h. p. for an air-drill of the same size. Taking into consideration also the fact that electricity is more economical to generate and transmit, it would seem as though there ought to be a large field for its use in the mining industry in the future. The very fact that it has driven everything before it in the industrial field ought to be proof enough of its fitness for work in mines and quarries.

IN DIAMOND DRILL BORING a solid core of rock is removed in sections, enabling accurate determination of the character of the rock formation throughout the depth of the bore, and this without the great expense of sinking a shaft. On the gold-bearing reefs of the Transvaal borings of great depth have been made, the two deepest recorded being each more than 1 mile—5,582 ft. in that near Johannesburg, which required nine months for sinking, and 5,560 ft. in the one near Doornkloof, the boring of which occupied 14 months. In each case the core removed from the boring had for the greater part of the depth a diameter of 1⅞ in. It is interesting to know that the machinery used in the South African fields for this work is nearly all imported from the United States.—*Iron Age.*

Silver Currency Conversion Table.

U. S. CURRENCY.		MEXICAN CURRENCY.		ENGLISH CURRENCY.		
Silver Value Per Ounce.	Silver Value 1 Kilogram.	Silver Value Per Ounce.	Silver Value 1 Kilogram.	Silver Value Per Ounce.	Silver Value 1 Kilogram.	Silver Value 1 Kilogram.
CENTS.	DOLLARS.	DOLLARS.	DOLLARS.	PENCE.	PENCE.	£ s. d.
50	16.0752	1.01125	32.51203	24.65838	792.77514	3 6 0.77514
51	16.3967	1.03148	33.16512	25.15154	808.63064	3 7 4.63064
52	16.7182	1.05170	33.81521	25.64471	824.48614	3 8 8.48614
53	17.0397	1.07193	34.46530	26.13788	840.34164	3 10 0.34164
54	17.3612	1.09215	35.11539	26.63104	856.19714	3 11 4.19714
55	17.6827	1.11238	35.76548	27.12421	872.05264	3 12 8.05264
56	18.0042	1.13260	36.41558	27.61738	887.90814	3 13 11.90814
57	18.3257	1.15283	37.06567	28.11054	903.76364	3 15 3.76364
58	18.6472	1.17305	37.71576	28.60371	919.61914	3 16 7.61914
59	18.9687	1.19328	38.36585	29.09688	935.47464	3 17 11.47464
60	19.2902	1.21358	39.01594	29.59005	951.33014	3 19 3.33014
61	19.6117	1.23373	39.66603	30.08321	967.18564	4 0 7.18564
62	19.9332	1.25395	40.31612	30.57638	983.04114	4 1 11.04114
63	20.2547	1.27418	40.96621	31.06955	998.89664	4 3 2.89664
64	20.5762	1.29440	41.61630	31.56271	1,014.75214	4 4 6.75214
65	20.8977	1.31463	42.26639	32.05588	1,030.60764	4 5 10.60764
66	21.2192	1.33485	42.91648	32 54905	1,046.46314	4 7 2.46314
67	21.5047	1.35508	43.56657	33.04221	1,062.31864	4 8 6.31864
68	21.8622	1.37530	44.21666	33.53538	1,078.17414	4 9 0.17414
69	22.1837	1.39553	44.86675	34.02855	1,094.02964	4 11 2.02964
70	22.5052	1.41575	45.51684	34 52173	1,109.88519	4 12 5.88519
Difference 1c U. S. currency.	Difference 32.15034c U. S. currency.	Difference 2.0225c Mexican currency.	Difference 65.009057c Mexican currency.	Difference .4931675 pence English currency.	Difference 15.855503 pence English currency.	

This table is based upon the following relations:

1 Cent U. S. = .4931675 pence English.
$4.8665 U. S. = 1 pound English.
1 Dollar U. S. = 2.0225 dollars Mexican.
1 Grain Troy = 1 grain Avoirdupois.
1 Ounce Troy = 480 grains; 1 ounce Av. = 437.5 grains.
1 Kilogram = 2.2046 lb. Av.
1 Kilogram = 32.15034 oz. Troy.

THOS. E. FISHER, E. M.

Tales of the Desert.

Written for the MINING AND SCIENTIFIC PRESS by GEORGE J. BANCROFT.

By reason of deficient rainfall a large part of the West and Southwest is barren. This region is called the Desert. The lack of water is being remedied, in places, by irrigation, so that many million acres have been won to cultivation. But with all the desert's potentialities as an agricultural region, it is the mineral deposits that always did, and always will, best encourage development.

Prospecting in the Desert.

There is one portion of the desert which seems to have been reserved by some supreme power for the present generation to exploit. This is the most arid part embracing the Mojave, Colorado and Red deserts and the Death Valley country. It seems that every single prospector who made a discovery in this tract prior to the last decade, and tried to work his find, paid for it with his life. There was 'Peg Leg' Smith who set out in 1884 to travel from Yuma to San Diego. He lost his way and found a gold deposit of extraordinary richness; finally, he reached Los Angeles more dead than alive, but with his pockets full of nuggets. Prospector-like, he proceeded to go on a grand spree as soon as he had recovered from the effects of his trip. When the gold was all gone, he borrowed a horse and slipped away in the night, returning in five days with six tobacco-sacks full of gold, and again went on a spree. He kept this up for some time, and several attempts were made to follow him; all but two men lost his trail in the desert, and those two never came back. Finally Smith agreed to take a friend with him on his next trip. He went on an unusually heavy debauch and died of alcoholism before he could even describe the location.

When the Southern Pacific grading camp had reached a point near Gloster on the Mojave desert a squaw struggled into camp one day with her mouth swollen from thirst and the fever of death upon her. The grading foreman took care of her and nursed her back to life. When she recovered she produced a buckskin bag with about $5000 in gold and gave it to the foreman. To all entreaties she refused to tell where she got it. She said her 'buck' had died from thirst on the desert and that the Great Spirit did not want the white men to know where the gold came from. At last accounts she was living with her tribe at Yuma and still preserved the Great Spirit's secret.

In 1894 the men who drive the borax wagons picked up a prospector at Six-Mile Station and brought him into Mojave. His name was Golder. He was an old man and he was crazy from thirst and nearing death. In his pockets were three gold nuggets which had a total value of $3654. He became partially sane before he died and tried to draw a map and show where he got the gold. He said he had been out of water for three days and his burros could go no further, so he unpacked them and turned them loose; he then climbed to the top of a high hill which was just north of where he left the burros. From the top of the hill he saw trees about five miles away and started for them. Just as he left the top of the hill he stumbled over a gravel bed full of gold nuggets. He was too far gone to stop to gather many, but he picked up the three biggest and put them in his pocket. He went to the water and drank too much and it made him crazy. After that he remembered nothing until he was picked up by the borax team.

Such was his story. Of course there was a stampede and the packs and burros were soon found. The burros were dead. The hill to the north was just as Golder described it, but no trees were visible from its summit and no gold was found just over its crest. There was no water in that direction nearer than Red Rock, which was 25 miles distant. The man had probably been out of his mind part of the time for days and there is no telling when or where he found the gold.

Sometime in the 80's a prospector named Breyfogle came into Austin with specimens of gold-quartz literally hung together with wire-gold. He described a large vein of it as existing near Death Valley. A party of his friends was organized at once and set out for the find. When Breyfogle got down to the vicinity of his find he became confused and could not identify it. His party lost faith in him and accused him of being an impostor. Finally they left him with a very little food and returned to Austin. Breyfogle continued his search, going into the Ash Meadows ranch occasionally to beg a little flour. One day he came in exultant. He had re-discovered his mine and had a large sack of the fabulously rich stuff. He was sick and famished but insisted on starting at once to carry the good news to his friends at Austin, so the ranchman started with him. Breyfogle became suddenly worse on the third night out and died before he could tell the ranchman where to find the mine.

The new camp of Bullfrog is near Breyfogle's country and some recent strikes made in the Funeral range are said to be in the very locality where Breyfogle camped.

About the time of the Breyfogle episode two men came into Keeler and disposed of several hundred dollars worth of coarse gold. They apparently had a great quantity tied up in bags. They said they had had an awful time; that their partner had died; that there was a curse upon the land and that they would tell no one where they got the gold, that they were going to return to their farms in the middle West and never again venture on the desert. They left no names or address.

In the summer of 1869 the party of Abner McKeever was massacred by Apaches at the big bend of the Gila near Camp McDowell, in Arizona. McKeever's pretty daughter, Belle McKeever, was carried away as a captive. A party of soldiers gave chase. The Indians separated in many bands and the soldiers were obliged to do the same. The party taking the most westerly trail consisted of Sergeant Crossthwaite and two privates, Joe Wormley and Eugene Flannigan. These three men followed the Indian trail till two of their horses perished with thirst and all their provisions were gone. They took some of the flesh of the dead horses and under Flannigan's leadership struck out north for a range of low hills, as they supposed east of the Granite Wash mountains, where Flannigan had seen signs of water. They found water only just in time to save their lives, but not soon enough to save the reason of Wormley, who had gone mad. Next morning Flannigan went to the spring for another drink and found the gravel was full of large nuggets of gold. He traced the gold to two veins which crossed the gully. One of these was narrow, the other about 16 feet wide, both veins were composed of honeycomb quartz showing coarse gold plentifully scattered through it. The three soldiers gathered all the nuggets they could scratch up with their hands and some of the richest pieces of rock, about 50 pounds in all. They loaded this on their one remaining horse and set out for the Gila river. The last day they became separated. Crossthwaite died on the desert; Wormley reached the river and was found by some officers who straightway set out to find his companions and picked up Flannigan, who was out of his head by this time. Wormley eventually recovered his reason but could never recall anything at all of this terrible trip and the wonderful discovery of gold. When Flannigan recovered his reason and began to tell of the wonderful discovery of gold his story was so hard to believe that it was thought he still retained a mad streak due to his awful sufferings. But a few days later the horse was found dead on the desert with the gold ore still strapped on his back and $1800 was realized from the sale of the 50 pounds of quartz. Crossthwaite's body was also found, and on it was a map showing the position of the discovery. Flannigan made several attempts to return to his find, but he was always timid about venturing far from the river, and then again he always relied on Crossthwaite's map, which was probably all wrong. Flannigan finally died at Phœnix in 1880.

A Desert Mining Camp.

So go the tales of the desert. Nowadays automobiles and frequent wells make the worst journey of all, that across the Ralston Desert, a matter of a few hours' pleasant spin. Death Valley has several thriving farms and is an ideal place to raise oranges and lemons. Mining camps are springing up all over the driest country; truly this is the day of the desert.

Structural Features of the Ontario Mineral Belt, Park City, Utah.

Written for the MINING AND SCIENTIFIC PRESS by WALTER P. JENNEY.

From the higher peaks of the Wasatch range, where rise the American Fork and the Big and Little Cottonwood creeks, the great mineral belt stretches east nearly to the valley of the Provo river. The explored length exceeds eleven miles, the breadth of the belt varies from four to four and one-half miles.

It is a region of great producing mines; from a comparatively narrow section of the belt, less than three miles long, covered by the Ontario, Daly, Daly–West and Daly–Judge properties, an aggregate output, in silver and lead ores, of $60,000,000 has been made. No less is it a region teeming with interest to the geologist and the student of vein-phenomena. Here are to be found great fissure lodes, carrying silver-lead ore in shoots, associated with extensive flat sheet-like deposits of similar ore, formed by the replacement of a special stratum of limestone. Then there are novel exhibits of varied structural conditions which are involved in the localization and deposition of the ore. And last, we have what appears to be a new and singular type of fissure vein, in which the ore formed within the walls has not solely been brought up from the depths through the fissure itself, but has, in great part, been introduced into the lode at intervals in its rise toward the surface, by the agency of tributary fissures or 'verticals' coming up through the foot-country.

Four distinct sedimentary formations occur along the course of the belt, between the surface and the greatest depth explored, namely, the 2,000-ft. level of the Ontario mine. They are, first, the Upper Carboniferous, or 'black' limestone, covering the surface from the Daly shaft west and southwest across the properties of the Daly–West and Daly–Judge, to the crest of the Cottonwood divide; second, the Lower Carboniferous quartzite directly underlying it, usually designated as the Ontario–quartzite. A third stratified formation, developed in the lower levels of the Ontario and Daly mines, is known as the 'blue' limestone, or lower limestone. Along the northwestern flanks, a great thickness of Mesozoic shale and sandstone rests unconformably on the eroded surface of the black limestone. As this more recent formation is in no place cut by the Ontario lode, in the section described, it may properly be disregarded in the discussion of the mineral deposits.

The black limestone, often called the 'upper' limestone, attains a maximum thickness of 2,000 to 2,500 ft., made up of alternating strata of limestone and shale, with occasional thin beds of quartzite. These variations in the strata of the upper limestone are the result of frequent and repeated changes in the conditions of sedimentation in the sea in which the beds were laid down; a deepening or shoaling of the water—any change in the ocean currents and in the sediment transported—or some modification of the life-conditions prevailing, have influenced the nature and composition of the sediments, and the rocks eventually formed by their consolidation. Local variations also occur in the beds themselves, some strata changing in character even within a few hundred feet; other beds are substantially uniform and continuous as far as they have been explored in the workings of the mines. It will be shown in the discussion of the mineral formations in this limestone, that the structure and composition of the rock have determined the deposition of the ore in certain beds.

The Ontario-quartzite is 2,200 ft. thick; massive beds of hard white crystalline rock form the upper 1,500 ft., while the basal strata are impure sediments, soft silicious and clay-shales which pass into the lime-shale at the top of the lower limestone, without any well-defined separation.

This lower, or 'blue' limestone, changes in character with depth, becoming more nearly a pure limestone, the shale layers giving place to thin-bedded lime, very close and tight in structure. Its thickness has not been determined, but is known by exploration to exceed 1,500 feet.

Dikes of porphyry and other volcanic rocks intrude in places among the stratified formations. In the region about Bonanza Flat and the Big Cottonwood divide, large masses of granite and diorite occur. The volcanic activities giving rise to these varied intrusions, although they occurred at a relatively late period, long preceded the formation of the vein-fissures and the deposition of the ore; even the more recent of these dikes are cut and faulted by the mineral-bearing fissures.

The effect of these igneous emanations has been to alter the upper limestone to marble. Over broad areas in the Daly–Judge mine, the limestone beds for hundreds of feet thick, are bleached and metamorphosed into a fine-grained, crystalline marble, usually light gray in color. So perfect occasionally is this regional metamorphism, that the iron and the organic matter which gave to the original rock its dark color, are in some beds completely removed, with the production of pure white marble. In like manner the quartzites in some places in the western part of the mine are bleached, and resemble marble so closely, that it is difficult to distinguish these altered rocks, which are nearly pure silica, save by their hardness, or by testing with acid.

The porphyry and other igneous rocks are not in themselves ore-bearing. The mission of the great volcanic outbursts, which time after time have taken place in the mineral region, has been to fracture and open the strata for the reception of the ore. Near the close of the eruptive period, other igneous disturbances, deep-seated in the earth's crust, produced the fissures, and still later, inaugurated the ore-forming period, energizing the intense thermal and chemical activities that created the mineral deposits.

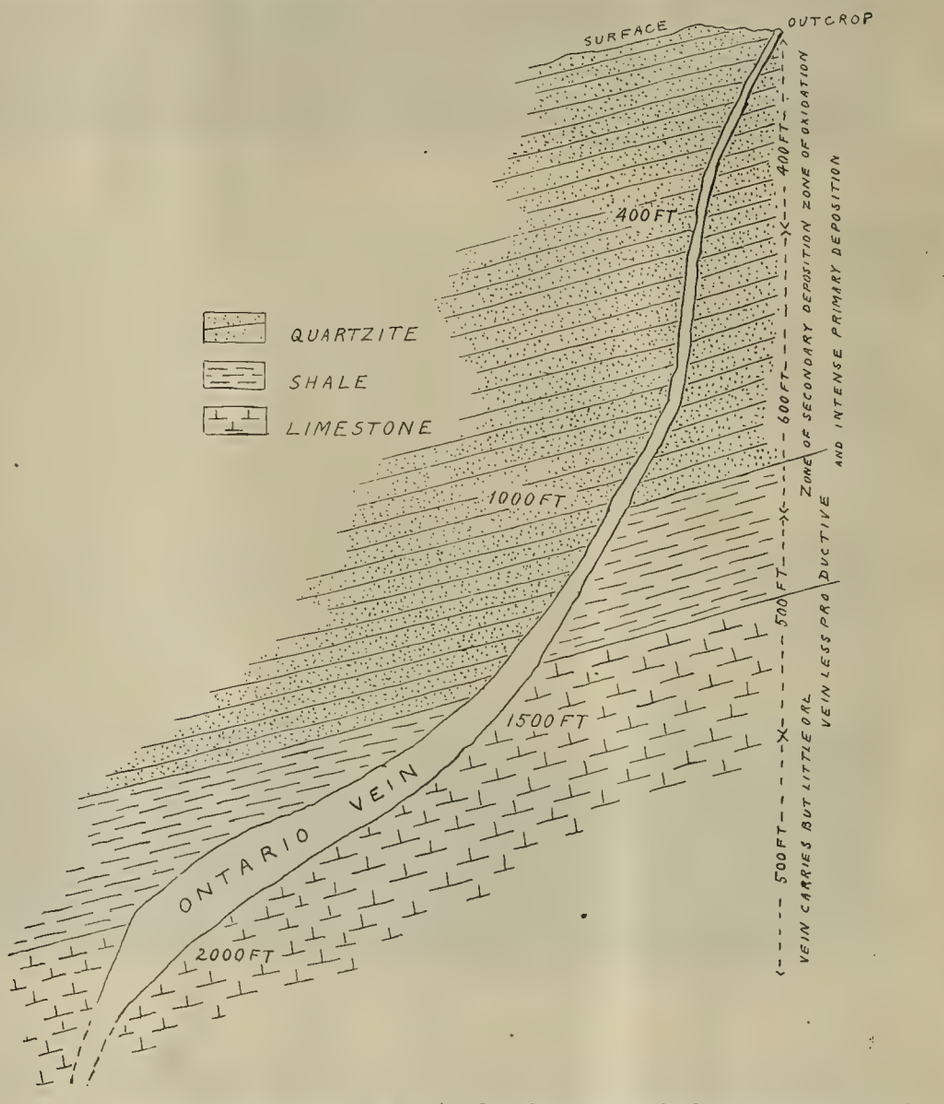
Ore-deposits in the sedimentary rocks, irrespective of the nature of the minerals constituting the ores, conform to the general law of selective deposition, namely, that, "*Some geological formations appear to be everywhere barren of ore; others occasionally carry small deposits, workable where the conditions are exceptionally favorable; but in each mining region, certain strata are ore-bearing in a degree exceeding all other formations combined.*"*

The Ontario-quartzite is the great ore-bearing formation of the Ontario and Daly mines, it is the wall-rock of the veins, from the surface to the 1,500-ft. or drain-tunnel level. The bedding of the sedimentary rocks is gently inclined, while the veins dip at a steep angle, and in their descent into the earth, cut the beds from the surface downward; when followed in depth, the vein passes successively through each geological formation, and the wall-rock varies with each change of the strata. These changes have influenced the deposition of the ore. In the Ontario and also in the Daly, where hard quartzite forms the walls, from the outcrop down to about the 1,000-ft. level, the ore-shoots are sheet-like in form, regular, continuous, and of great length; the ore is high-grade and is concentrated within comparatively narrow limits.

The shale beds, 500 to 600 ft. thick (lying between the hard quartzite and the lower limestone), owing to the soft and clayey nature of the rock, are generally unfavorable to ore. It is observed in these mines, that when the veins pass out of the quartzite into the shale, the ore deposits are small and continuous only for short distances. This fact is made even more plain by the relative production of the veins where traversing the several formations; more than 90 per cent of the ore was extracted from stopes where either one or both the walls were made by the Ontario quartzite.

The Ontario fissure, which maintains in the quartzite a nearly vertical attitude, flattens, in traversing the underlying shale, to a dip in some instances as low as 35° from the horizontal. Likewise the size of the vein also is influenced by the enclosing rock; where the walls are formed by quartzite, the ore-shoot averaged three to eight feet thick, seldom exceeding a width of 20 ft. of pay-ore; but on entering the shale the fissure increased greatly in size, attaining in places a breadth of 250 ft. or more. (See sketch). Occasionally such broad expansions of the lode were traversed in an irregular manner by three or more widely separated ore-streaks or subordinate veins, instead of the single sheet of mineral usually occurring in the upper levels. As, under these circumstances, the whole breadth of the vein had to be explored and each lode deposit mined and timbered by itself, the working charges were greatly increased.

In the Ontario mine, the lower limestone, where it forms the fissure-walls from the 1,500-ft. level to the 2,000-ft. level, is much more favorable to ore than the overlying clay-shale.



Near the contact of the Ontario quartzite with the 'upper' or black limestone, there occurs a stratum of soft gray limestone (25 to 35 ft. thick), resting upon a thin quartzite, separated from the Ontario quartzite below, by 100 ft. of impure and cherty limestone. Extensive and valuable deposits of silver-bearing galena are mined in this gray lime overlying the upper quartzite. Examined more particularly, this special ore-bearing formation is seen to be made up of heavy beds of fine-grained crystalline limestone, remarkably uniform in character, separated by shale-partings of varying thickness. In places, these shale layers thin out, so as to form a massive stratum 20 ft. thick; more commonly, four to eight feet of shale intervenes between the lime beds. Where oxidized by the action of surface waters, the gray limestone is brownish-black in color, owing to oxides of manganese and iron.

It is a singularly fragile and brittle rock, splitting readily in a direction at right angles to the beds. This peculiar fracturing of the gray lime is observed where pillars are left in the stopes; in a short time the weight of the roof crushes the rock into innumerable broad thin flakes, perpendicular to the bedding planes. It will be seen that the fragile character of this formation, causing the beds to be crushed and

* 'The Lead and Zinc Deposits of the Mississippi Valley' by W. P. Jenney, *Transactions* American Institute of Mining Engineers, Vol. XXII, pp. 187-188.

shattered by crustal movements, has influenced the deposition of the ore. Further, there are many evidences in the way that the mineral-forming waters have eaten out this limestone in huge pot-holes along the course of the fissures, and have replaced the rock itself by ore, that it was highly soluble and readily attacked by the heated waters or vapors.

In mineral formations of this character, not only in this, but in other mining regions of the West, the general law of special occurrence is found to hold good, namely, that "*Certain beds appear to have been peculiarly favorable to the deposition of ore. The beds immediately above or below the ore-impregnated strata are ordinarily barren. This occurrence of special ore-bearing beds, alternating with barren strata, is usually found to prevail through a given area of disturbance and mineralization.*"† Such beds, the prominent ore-producers of a district, are particularly sought in prospecting. They are known as 'ore-horizons,' and often occur one below another, forming a vertical series of orebodies. These ore-horizons may be of any thickness, limited only by the occurrence of beds of uniform character and composition, favorable to the precipitation of particular minerals. The intervals of separation between the several horizons are dependent on the thickness of the intervening non-mineralized strata. Recent developments in these mines afford evidence that likewise, in places where the conditions are favorable, ore-deposits occur in lime beds, situated at different levels, or distinct horizons, above the contact; a subject that I shall treat more fully later.

While it may be accepted, that the ore-bearing quality of the special bedded formation occurring at the quartzite contact, is proved beyond all question, it must be admitted, that as regards the influence of the upper limestone, where it forms the walls of the veins, the evidence is conflicting. An understanding of the conditions which influence, or in any way modify, the productiveness of the veins, is of the first importance in the development of these mines; particularly, information of the special conditions controlling the localization, or determining the position in the fissures, of the orebodies.

In these formations, the effect of the wall-rock upon the ore-bearing character of the vein is mainly due to the nature of the attrition material which fills the fissures and constitutes the gangue (or matrix of the ore). This attrition breccia is largely formed from the fragments detached from the walls, crushed and ground by the movement of one wall upon the other. For this reason, the structure and the chemical composition of the strata enclosing the vein determine largely the favorable or non-favorable character of the gangue. The special influence of the geological formation on the deposition of the minerals is far less pronounced in certain other mining regions, where the quartz filling the fissures is formed by silica-bearing waters, and only in small part is composed of rock derived from the walls. Weed observes that fissures filled by crustification are often seen to be unaffected in the nature of the ore and the associated minerals, by changes in the wall-rock.‡

It can be understood readily that the diverse nature of the strata constituting the great thickness of the black limestone (some beds being nearly pure limestone, other beds containing a large proportion of silica or of clay), necessarily have influenced the deposition of the ore, where these rock strata actually enclose the vein. Further, long prior to the formation of the mineral-bearing fissures, the metamorphism of this lime formation, caused by volcanic intrusions, has in many places, particularly in the Daly–Judge mine, greatly changed the structure and chemical composition of the rock. In many instances large blocks have been displaced by the faulting movements (that made the vein fissures), so that in places the beds which form the foot and hanging walls on the same level are not identical. All of these factors must be taken into consideration, where the veins traverse the black limestone, in order to determine the influence of the walls upon the formation of the mineral deposits.

The ore-shoot in the Back vein of the Daly–Judge mine has been stoped from the 1,400-ft. level to above the 600-ft. level, a distance of more than 900 ft., measured on the dip of the vein. All the way, from the Ontario quartzite at the 1,350-ft. level upward, the walls are the upper limestone; throughout the extent of the shoot the ore has been of good grade, continuous, and uniform in mineral character.

The upper limestone has been removed by erosion over the outcrop of the Ontario lode, so that no evidence bearing upon this question can be obtained from that mine. On the other hand, the behavior of the Daly vein in the black limestone, in so far as it has been explored, seems to show that this formation is generally unfavorable to ore. The productiveness of this vein in the Ontario quartzite has been shown. It was also very productive in the upper levels of the Daly, with the Ontario quartzite forming the foot-wall, and the upper limestone the hanging. But in the western part of the Daly mine, between the surface and the 600-ft. level, the vein entered the upper limestone, and no longer carried pay-ore.

The vein behaved in much the same way in the Daly–West mine. In the Ontario quartzite, at the 1,500 ft. level, the fissure is uniform in width, measuring five to eight feet between walls, and the ore is of good grade. When followed west on this level, the upper limestone appears on the hanging, the foot remaining quartzite, and the change in wall-rock is seen to increase the width of the fissure. The grade of the ore is reduced, owing to the masses of waste which cannot be separated in mining, although the tonnage is increased. Further, the large ore-shoot on the 1,300 and the 1,400-ft. levels, in the western part of the mine, has been highly productive, where the foot-wall is quartzite, and the hanging wall black limestone. When this shoot was stoped above the 1,200-ft. level, the ore continued for 60 to 70 ft. and terminated where the fissure entered the upper limestone.

This evidence would seem to imply that from some cause the Daly vein is not productive in the upper limestone, at least, so far as it has been prospected in the lowest (or basal) beds of that formation. It is true, however, that only limited exploration has been made in the upper levels of any of these mines where the walls are limestone, and that experience in mining the Daly vein has shown that, not infrequently, long barren intervals separate orebodies, and that shoots with a flat pitch often are bounded by unproductive ground above and below. Only exploration will settle this question definitely.

Reviewing the influence of the wall-rock upon the nature of the gangue, upon the richness of the mineral deposits, and upon the localization of ore-shoots, it is observed that the wall-rocks most favorable to ore are hard and crystalline, nearly free from clayey material, yielding (when crushed, brecciated and ground between the fissure-walls) an open permeable matrix for the reception of minerals; that soft shaly strata, formed from impure sediments, are generally unfavorable, owing to the plastic or sandy clay produced by the decomposition of the rock, filling the interspaces in the matrix and rendering that portion of the vein, where such beds constitute the walls, impervious to the circulation of mineral-bearing waters.

The effect of clay, in thus acting mechanically so as to prevent deposition of minerals, is seen in places in the Ontario mine, where the vein, carrying ore, cuts through porphyry dikes; the clay derived from the decomposition of the igneous rocks usually causes the ore to pinch to a thin seam, or to occur in small stringers or bunches, scattered through the fissure where it traverses the porphyry; the orebody again becomes regular and continuous, after passing beyond the influence of the local change in the walls.

Limestone, either pure lime-carbonate or nearly pure dolomite, forms an exceptionally favorable vein-wall; the ore is deposited not only within the fissure, but frequently extends beyond it for a distance, impregnating the country. In such occurrences, chemical factors become dominant, the solubility of the rock, the effect of the carbonic acid liberated by the reaction, as well as any carbonaceous matter contained in the rock and set free by its dissolution, and the action of the dissolved calcareous substances in destroying the chemical equilibrium of the mineral-saturated waters, causing the precipitation of the metals.¶

CLEANING AMALGAMATING PLATES.—The preliminary setting of plates is well known, and it suffices to say that the copper must be thoroughly well cleaned before the mercury is used; the plate being carefully kept clean is allowed to accumulate a thin layer of hard amalgam, and when this is accomplished the routine work of dressing, scouring, brushing, and the many attendant burnishing methods so dear to amalgamators is continued day by day. By thoroughly scouring or loosening the amalgam by means of rubbing the whole surface of the plate with a little clean sand or gritty matter, the amalgam becomes pasty and is easily removed without unduly affecting the copper itself, as with a chisel or other sharp instrument. Where this work is well done the maximum amount can be taken from the plate each shift, and will prevent undue accumulation beside largely obviating the necessity of frequently steaming the plate.—Fraser Alexander, *Chem. Met. Soc. of South Africa.*

THE miner calls everything which results in the non-explosion of his charge a miss-fire, and the term is therefore one which is enigmatical. Miss-fires in the ordinary sense occur through the miner omitting one or other of the rudiments of his business, through the detonator becoming detached from the charge, and through many other similar causes. A miss-fire from the chemical point of view is, however, a very different matter, and is generally caused by an insufficiency of either explosive or detonating mixture, or by a certain physical condition of the explosive itself. The results of a miss-fire such as this are most serious, for not only might a part of the whole of the charge be left in the bore-hole, endangering the miners' lives, but through the incomplete explosion poisonous gases arise.—E. H. Weiskopf, *Chem. Met. Soc. of South Africa.*

† 'The Lead and Zinc Deposits of the Mississippi Valley,' by W. P. Jenney, *Transactions* American Institute of Mining Engineers, Vol. XXII, pp. 187–188.

‡ W. H. Weed. *Transactions* American Institute of Mining Engineers, Vol. XXXI, p. 642.

¶ 'Chemistry of Ore Deposition,' *Transactions* American Institute of Mining Engineers, Vol. XXXIII, p. 483.

The Cyanide Process at Guanajuato.

Written for the MINING AND SCIENTIFIC PRESS by FRANCIS J. HOBSON.

In 1899 a number of cyanide tests were made on Cubo ore by chemists in the employ of the Mexican Gold & Silver Recovery Company, the owners of the MacArthur Forrest patents in the Republic of Mexico. The results of these tests were far from satisfactory. The consumption of cyanide was low but the extraction also was low, averaging from 40 to 85 per cent of the silver and gold in the ore. Most of the tests were made on samples weighing 100 grams, crushed to pass screens from 30 to 80–mesh. In addition to solutions of potassium cyanide there were added to the charges under treatment, different percentages of potassium ferri–cyanide, permanganate and even ferro–cyanide, and to some of them were added various amounts of sodium dioxide. The time of treatment, in nearly every case, was 16 hours. In consequence of these experiments, the process was condemned at Guanajuato. Shortly afterward, on the recommendation of E. A. Wiltsee of the Venture Corporation, the Holmes brothers experimented for several months on Sirena and Cubo ores; the results of these further experiments led them to conclude that the ores of this district could be successfully cyanided by sliming everything. One point in their report was especially prominent, that even with 40 days' leaching the sand resulting from crushing to 40–mesh gave no extraction by treating with cyanide solution. This was on Sirena ore. About three and a half years ago the Butters company took up the question of cyaniding the Sirena ore, and E. M. Hamilton, of that company, ran a series of tests on a large scale at the hacienda Pastita, treating sand and slime after ore concentration on Wilfley tables; leaching the sand and agitating the slime. The ore was crushed in a stamp–battery to pass a 30–mesh screen. Fifteen days' leaching of the sand with 0.3 per cent cyanide solution, and slime–agitation with 0.05 per cent solution, gave excellent extraction. The metals in both cases were electrically precipitated on sheet–lead cathodes. The total extractions recovered by Mr. Hamilton from two series of tests showed 92.5 and 94.5 per cent of the total value of the ore, the yield being in concentrate and bullion. On the basis of Mr. Hamilton's experiments the Guanajuato Consolidated Mining Company installed the present excellent plant, with a capacity of approximately 200 tons per day.

Two years ago I was engaged by the American Finance & Security Company to make a metallurgical examination of the Valenciana ores. The material treated first came from the Guadalupe dump, a dump which contains about 1,000,000 tons of ore. The tests were made on part of the samples taken from shafts which were sunk through the dump in order to ascertain its value. The tests were made with the 5–stamp mill and cyanide plant at the hacienda Central. First we milled several lots of ore with battery screens ranging from 20 to 30–mesh, concentrating on a Wilfley table, separating sand and slime with spitzkasten and spitzlutten. The spitzlutten were placed immediately under the spitzkasten. An excellent separation was obtained, making approximately 70 per cent of sand and 30 per cent of slime. About 500 lb. of sand and 150 lb. of the slime were shipped to Mexico City and there subjected to experiment in the laboratory of the Mexican Gold & Silver Recovery Company. Lots (each 5 kilo.) of ore were leached continually, with solutions varying from 0.1 to 0.7 per cent KCy for 15 days. In each case the silver and gold were precipitated on zinc shaving. A tailing sample was taken daily for 15 days, there being 21 sand–charges under treatment. At the end of 12 days the extraction ceased. Cyanide consumption ranged from 0 75 to 1.5 lb. per ton of ore treated. With 0.3 and 0.4 per cent solutions the extraction was equal to that secured with stronger solutions, and the consumption of cyanide was only one pound per ton of ore treated. The experiments on slime were run on a very small scale at first, agitating in bottles with various strengths of solution; a chemical extraction of about 88 per cent of the silver was obtained with a 0.05 per cent solution, with a chemical consumption of about one pound of potassium cyanide per ton treated. Then tests were made on a larger scale, using compressed air for agitation and a 0.05 per cent solution. Both decantation and the Moore filter–press methods were tried for separating solution from residue. Both were efficient but no apparent advantage could be gained by use of the Moore filter, the only saving being in cyanide, and this was so small that there was no profit in using the method, leaving out the question of royalties. The metals were precipitated on zinc shaving. Exhaustive tests with zinc–dust precipitation were not at all satisfactory. To my personal knowledge this was the second case where zinc–dust precipitation would not work. With these results for a guide, I milled 70 metric tons from the Guadalupe dump at the hacienda Central, concentrating, separating sand from slime, and cyaniding them separately. I used a 0.4 per cent solution for leaching sand and 0.05 per cent for agitating slime. Approximately 35 per cent of the ore value was separated in the form of concen-

trate. We obtained an extraction on sand of 86 per cent of the silver and 97 per cent of the gold; from slime, we extracted 90 per cent of the silver and 97 per cent of the gold. The time of sand-leaching was 12 days, and the total time of slime-treatment was three days, one day of which was active agitation. On sand, the consumption of cyanide was 1.1 lb., and on slime, including mechanical loss, it was a trifle less than 2.5 lb. per ton of dry slime. The metals were precipitated on zinc shaving. A clean-up was made, the coarse zinc was reduced with sulphuric acid, and the product melted into bullion. The two bars of bullion thus obtained contained in gold 2.4 cents per ton of ore more than the assays indicated. The silver, on the other hand, was 8 grams, per ton of ore, short. Taking into consideration the fact that the precipitation was in a new wood zinc-box and that, after the clean-up was made, it was shipped to the State of Michoacan to reduce coarse zinc with acid, and then melted four times in order to get bullion 900 fine, it could not be considered otherwise than an absolute check on the work. A lot weighing 100 kilo. of concentrate was shipped to Mexico City, one-half being leached without re-grinding; the other half was re-ground to pass 100-mesh, and was then treated with cyanide by the agitation and decantation method. In both cases the metals were precipitated on zinc shaving. The time of treatment in the first case was 90 days with 0.3 per cent solution; in the second, eight days, with same solution. Total extraction was more than 90 per cent. There was no trouble in precipitation. In both cases the clean-up checked the assays of heading and tailing.

In consequence of these experiments, the 80-stamp mill at the Bustos and the cyanide plant at the hacienda Flores are being installed. I entertain no doubt of obtaining in practice results equal to those achieved in the laboratory in Mexico City and in the experimental mill at the hacienda Central. The laboratory results and the extractions obtained in actual milling varied less than one per cent. I believe Mr. Hamilton's tests are being confirmed in practice at Pastita.

Two years ago the owners of the Cubo mine installed a cyanide plant at their hacienda. I am not familiar with the results obtained, but they appear to be good from the fact that the plant is still running. About one year ago the Peregrina Mining & Milling Company employed me to make a metallurgical examination. Results were highly satisfactory, 94 per cent of the precious metals being extracted; and the company is operating a 20-stamp mill and cyanide plant; they are now erecting an additional 100 stamps with cyanide annex. It is stated that the Peregrina mill has obtained as much as 96 per cent extraction of silver. George W. Bryant has a cyanide plant in operation at the hacienda Central, and another nearly ready at Nayal; the extraction is satisfactory and this plant also is being enlarged. Frank G. Peck, of the Portland Mining Company at Cripple Creek, has purchased, and will soon have erected, a 40-stamp mill and cyanide annex at the hacienda San Matias. Mr. Ibarguengoitia has changed his patio process to cyanidation, and is treating daily about 30 tons of custom ore. The Adams Company at La Luz expects to erect 100 stamps with cyanide plant. The Guanajuato district is now cyaniding 350 tons of ore daily; with the plants now purchased and under erection, this amount will be increased shortly to 1,400 tons per day.

GOLD-COPPER ALLOYS tarnish on exposure to air owing to oxidation of copper, and blacken on heating in air from the same cause. This oxidized coating may be removed and the color of fine gold (not that of the original alloy) produced by plunging the metal into dilute acids or alkaline solutions, the operation being technically known as 'blanching.' The color of the alloys may be improved without previous oxidation by dissolving out some copper by acids, a film of pure gold being left on the outside, which can be burnished. French jewelers use a hot solution of two parts of nitrate of potash, one part of alum, and one of common salt for this purpose. Nitric or sulphuric acid dissolves out the copper from gold-copper alloys under conditions similar to those under which it removes silver with gold-silver alloys. If the copper falls below 6.5%, the alloy is not attacked by these acids. *Aqua regia* dissolves all the alloys completely.—T. K. ROSE.

CORROSION OF THE STEEL FRAMES OF BUILDINGS.—An investigation of the best means of preventing corrosion of the steel used in the framework of modern buildings. There can be no question, the author says, that moisture and carbon dioxide are the active agents in causing the rusting of the steel. It has been held that the formation of a coat of rust upon the surface was the beginning of progressive action whereby the iron oxide acted as a carrier of oxygen to the steel beneath. It is extremely probable that in a comparatively dry place this action is exceedingly slow. Experiments made showed that neat Portland cement even in thin layers applied to clean surfaces was effective in preventing rusting. Cinder concrete from the presence of iron oxide is not so effective. Paints do not compare favorably with cement as a protection.—C. L. Norton, *Technology Quarterly.*

The World's Copper Trade.

Written by HORACE J. STEVENS.*

The world now consumes considerably more copper in a single week than was required for an entire year one century ago. In fact, the present-day consumption of those minor metals, aluminum and nickel, is about the same each as was the consumption of copper 100 years ago. Despite the popular impression that the bulk of the copper production is required for electrical uses, the demands of the engineering trades still require more than half of the entire output of the metal. The minor uses of copper are very numerous, and are steadily increasing. Sulphate of copper, used as a spray on grape vines and currant bushes, as an insecticide, takes tens of thousands of tons of metal yearly. There is a single concern in the Naugatuck valley of Connecticut that requires 10 tons monthly for watch dials. The orders of the pin-makers take vast quantities yearly, and such apparently insignificant things as brass balls for men's shoes require hundreds of tons annually. Modern buildings, both for residential and business purposes, are heavy consumers of copper, mainly in the form of brass for plumbing, gas and electric lighting fixtures, door butts and locks. Copper roofing requires large amounts of metal, and copper cornices consume materially larger quantities. While the bulk of the copper produced is required for the necessities of the engineering and electrical industries, no small amount is consumed for the little things, to which few but the close observers of the trade give attention.

The year 1905 has given much the largest production of copper ever known. For that matter, 1893 is the only year in the past quarter century in which the world's production of the metal has not increased, and a falling off in that year, as compared with 1892, was less than three per cent. The increased output of 1905, however, is incomparably the greatest ever made in the history of the trade. It amounted to 723,550 tons, as against 648,924 tons in 1904.

The production of copper by the United States and by the entire world has been as follows for the past ten years:

Year.	United States. Tons.	The World. Tons.
1896	205,384	373,363
1897	220,571	398 955
1898	235,050	429,156
1899	253,870	469,310
1900	269,111	485,854
1901	268,523	511,019
1902	294,297	542,167
1903	311,582	585,081
1904	362,739	648,924
1905	421,000	723,550

The estimated output of the world for 1905, which will be found not far from correct when compared with the final figures, indicates an increase of more than 116% in the decade since 1895—the largest increase ever made in any ten-year period.

For the first five years of the twentieth century the production of the world has been as follows, with percentages of increase from year to year:

Year.	Output. Tons.	Increase Per Cent.
1900	485,854	
1901	511,019	5.19
1902	542,167	6.99
1903	585,461	7.97
1904	648,924	10.83
1905	723,550	11.50

During the nineteenth century the average rate of increase, compounded annually, was a trifle more than 4 per cent. The average ratio of increase in production (which in the long run means consumption also) of the leading commercial metals, including copper, iron, lead, tin and zinc, and also coal, the necessary concomitant of the metals, was six to seven per cent annually, compounded, during the last half of the nineteenth century, with 6½ per cent as an approximate constant. That the production and consumption of copper are upon a new basis in the twentieth century is shown by the figures of the last table. The net increase of 1905 production over the output of 1900 is 48.88 per cent. It has been an axiom of the metal trade for some years that the normal ratio of increase in copper production is eight per cent annually, and the figures of production for the first five years of the present century bear out this theory in a most striking manner. Eight per cent, compounded annually for five years, would give an increase of 46.93¾ per cent, and, as a matter of fact, the 1905 production is 48.88 per cent greater than that of 1900. Furthermore, the production for the decade ending 1905 shows an increase of 116.30 per cent. As an increase of 8 per cent, compounded annually for ten years, amounts to 115.89 per cent, the increased production in the past ten years has been almost exactly 8 per cent per annum, compounded.

During the decade ending 1905, the production of the United States has increased 148 per cent, and the production of all other regions has increased 84 per cent. The largest percentage of increase outside of the United States is shown in other North American countries. For the decade ending 1905 the Canadian mines have increased production by 425 per cent and the mines of Mexico have gained 459 per cent. The mines of North America made 187,337 tons of copper in 1895 and 510,650 tons in 1905, an increase of 178 per cent. The rest of the world made 147,228 tons of copper in 1895 and 212,900 tons in 1905, an increase of 45 per cent.

In the following table is given an estimate of the output of the 42 copper mines of the world that have made 10,000,000 lb. or more during the year, with figures of 1904 for comparison:

Mines.	Pounds Avoirdupois— 1905.	1904.
Anaconda	105,000,000	90,000,000
Boston & Montana	90,000,000	94,000,000
Calumet & Hecla	82,500,000	80,341,019
Rio Tinto	80,000,000	80,214,400
Copper Queen	75,000,000	58,605,000
Greene Consolidated	60,000,000	55,014,339
Mansfeld	42,500,000	41,629,349
United Verde	36,000,000	29,500,000
United Copper Company	35,000,000	35,311,353
Arizona Copper Company	33,000,000	32,197,760
Calumet & Arizona	32,500,000	31,634,895
Old Dominion and United Globe	32,000,000	15,368,147
Original	30,000,000	20,500,000
Furukawa	23,000,000	21,599,300
North Butte	23,000,000	.....
Boleo	22,500,000	24,517,356
Trenton & Washoe	20,000,000	.....
Quincy	19,250,000	18,343,160
Detroit	19,000,000	16,623,251
Osceola	18,750 000	20,472,429
Mount Lyell	18,000,000	18,403,080
Cape Copper Company	18,000,000	17,192,000
Tamarack	16,000,000	14,961,885
Champion	15,750,000	12,212,954
Utah Consolidated	15,500,000	13,553,493
Butte & Boston	15,000,000	12,000,000
Aship	15,000,000	14,621,000
United States	14,500,000	12,000,000
Granby	14,000,000	13,431 236
Baltic	13.750 000	12,177,729
Bingham	13,000,000	11,500,000
Wallaroo & Moonta	13,000,000	13,070,952
Mitsu Bisshi	13,000,000	12 500,000
Besshi	12,500,000	12,000,000
Shannon	12,500,000	11,899,920
Parrot	12,000,000	12,500,000
Tharsis	11,500,000	12 590,228
Trimountain	11,250,000	10,211,230
Mountain Copper Company	10,000,000	19.116,160
Lota y Coronel	10,000,000	10,000,000
Montezuma	10,000,000	9,632,000
Guggenheim Exploration Company	10,000,000	6,000,000

The greatest gain has been made by the Copper Queen mine, in Arizona. The Anaconda has also made a substantial gain, and the United Verde shows a fair increase. The Trent and Washoe mines are amalgamated properties in Montana that were not on the producing list in 1904. The North Butte is an important new mine in the Butte district, made by the consolidation of a number of claims, with the old Speculator mine as a nucleus. The Guggenheim Exploration Company's Mexican properties are likely to become increasingly important producers of copper.

A glance at the various copper-producing countries of the globe shows that the most important developments have taken place in the the United States. The Lake Superior district has several new producers, all small at present, but destined to take high rank in the next few years, for the making of a Lake Superior mine that can turn out 10,000,000 lb. of fine copper yearly is a task requiring at least five years. In Montana, the Amalgamated Copper Company's mines at Butte show a large gain in production. The expensive litigation between Heinze and the Amalgamated interests has been stopped so far as concerns starting new suits or pushing old ones, and some sort of an agreement has been reached—if not a working alliance, at least a *modus vivendi*. The same strong interests that developed the Calumet & Arizona mine control the North Butte, a property that closes the year with a monthly production of about 3,000,000 lb. As the direct result of the opening of this wonderfully rich mine, a large addition has been made to the known productive and workable area in the northern part of the district. The Pittsburg & Montana, in eastern Butte, has added immensely to the prospective value of that portion of the district also.

Arizona has made a phenomenal increase during the year. The Copper Queen is now producing at about the same rate as the Rio Tinto and Calumet & Hecla, and is developing new mines that promise a further advance in the near future. The Lake Superior & Pittsburg and Pittsburg & Duluth have begun production in a small way with one leased furnace at the Calumet & Arizona smelter, and promise shortly to become large producers. The Graham county mines do not show any important change. The Globe district has more than doubled its production, and the Old Dominion has become one of the world's big mines. The Imperial mine, in Pima county, has made a considerable production, and should make in excess of 10,000.000 lb. in 1906. Exploratory and development work of a promising nature is under way in various parts of Arizona.

Utah has not largely increased its output, but shows a healthy gain. Developments at Bingham have been highly important and strong interests have secured two properties containing many million tons of low-grade ore. While the margin of profit will be small, owing to the very low grade of the ore, the tonnage is so enormous that Bingham must, of necessity, become an increasingly important factor in the world's copper supply. The Newhouse mines, in Beaver county, Utah, have begun production during the year, and will be followed soon by other properties in the same district.

California shows a decreased output for the year, due to construction of new and improved smelting and acid works by the Mountain Copper Company, but will gain considerably in production during the

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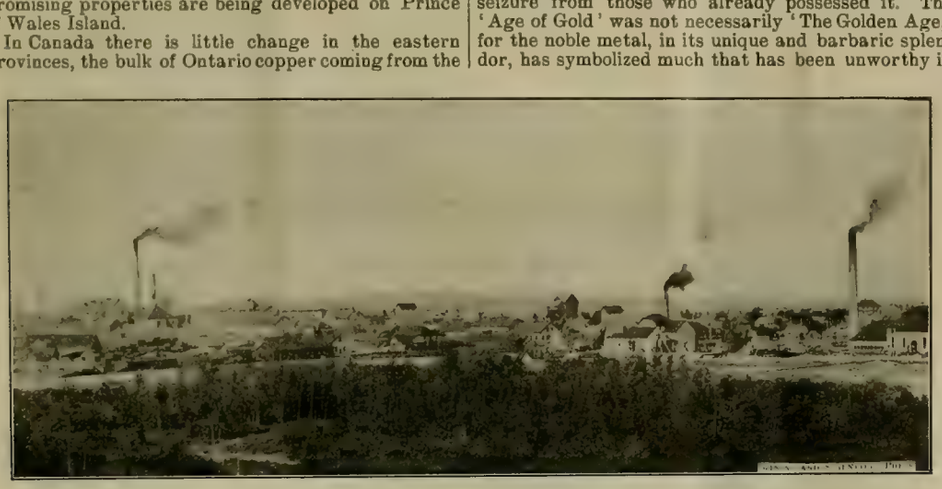
next few years. The United States Mining Company has secured and is now operating the Mammoth mine, and the General Electric Company has bought the Bully Hill mine and will enlarge production. In Wyoming, the Penn-Wyoming Company has produced about 6,000,000 lb. blister copper, and, with the completion of the new railroad into Carbon county, Wyoming should gain several other producers. Alaskan mines show an increasing production, and some promising properties are being developed on Prince of Wales Island.

In Canada there is little change in the eastern provinces, the bulk of Ontario copper coming from the nickel-copper ores worked by the Canadian Copper Company in the Sudbury district. In British Columbia the mines of the Boundary have made progress in the way of improving the finances of several of the weaker companies. The Boundary ores, while occurring in almost inexhaustible quantity, are very low grade, and the companies that work them successfully must have large capital as well as good management. The Granby remains easily foremost, and has had a very good year. The smelting plant is being increased, and the Granby is evidently destined to become a very large producer. On the British Columbian coast the Tyee, a promising property, seems to have fallen upon evil days, and the local management has been changed, with what seems undeserved contumely. The Britannia mine is being developed by strong and experienced copper men, and promises to be the leading producer of the coast. In the Yukon district a little copper ore of high grade is produced from the White Horse district.



Calumet & Hecla and Tamarack Mines, Michigan.

Mexico shows an increased production for 1905, though the gain is not so great as in the preceding year. The Greene Consolidated, at Cananea, remains the great producer, furnishing nearly half of the total output of the Republic. The management of the Greene is now considering plans, based on the methods used in Lake Superior iron ore mining, for greatly increasing ore extraction, while reducing costs per ton mined. The Boleo still finds difficulty in securing sufficient labor. The root of the trouble lies in the low wages paid, which are the same as ten years ago, while the Greene and other American-managed mines in Sonora and Chihuahua have more than doubled the former rate of wages paid the *peons*. Uprisings of the Yaqui Indians have greatly hampered developments at several promising new copper mines in the State of Sonora. The Moctezuma remains the third copper producer of the Republic, but the interests of the Guggenheim Exploration Company, which is closely related to the American Smelting & Refining Company, are becoming of greatly increased importance. The Teziutlan and several other independent mines are increasing their yield. The impetus already given Mexican copper mining is such that a steadily increased annual production may be expected.

Gold and Silver Production.

The Director of the Mint estimates the production of gold and silver in the United States during the calendar year 1905 to have been $86,377,000 of gold and 58,938,355 fine ounces of silver:

States or Territories.	Gold. Value.	Silver Fine Oz.	Silver Value at 61c.
Alaska	$14,650,000	236,578	$ 144,312
Arizona	3 500,000	3 400,000	2,074,000
California	17,502,000	879,411	536,440
Colorado	25,333,300	12,704,919	7,750,000
Idaho	1,550,250	9,000,000	5,490.000
Michigan		127,800	77,958
Montana	5,064,800	13,500 000	8,235,000
Nevada	4,700,000	6,000,000	3,660,000
New Mexico	413,400	250,000	152,500
Oregon	1,320,200	81,560	49,751
South Carolina	101,600	223	136
South Dakota	6,951,600	138,409	84,429
Texas	2,300	469,600	286,456
Utah	4,651,200	12,000,000	7,320,000
Washington	368,800	115 452	70,425
Wyoming	30,700	32,528	19,842
Total	$86,377,700	58,938,355	$35,952,396

The Klondike (Canada) produced $8,239,300 in gold, while Nome (Alaska) yielded $4,357,330.

Cyanide as a Factor in Gold Production.

In his presidential address before the chemical section of the British Association, G. T. Beilby said:

From the early beginnings of civilization gold has been highly prized and eagerly sought after. Human life has been freely sacrificed in its acquirement from natural sources, as well as in its forcible seizure from those who already possessed it. The 'Age of Gold' was not necessarily 'The Golden Age,' for the noble metal, in its unique and barbaric splendor, has symbolized much that has been unworthy in national and individual aims and ideals. With the advent of the industrial age gold was destined to take a new place in the world's history as the great medium of exchange, the great promoter of industry and commerce. While individual gain still remained the propelling power toward its discovery and acquisition, every fresh discovery led directly or indirectly to the freer interchange of the products of industry, and thus reacted favorably on the industrial and social conditions of the time. So long as the chief supplies of gold were obtained from alluvial deposits by the simple process of washing, the winning of gold almost necessarily continued to be pursued by individuals, or by small groups of workers, who were mainly attracted by the highly speculative nature of the occupation. These workers endured the greatest hardships and ran the most serious personal risks, drawn on from day to day by the hope that some special stroke of good fortune would be theirs. This condition prevailed also in fields in which the reef gold occurred near the surface, where it was easily accessible without costly mining appliances, and where the precious metal was loosely associated with a weathered matrix. These free-milling ores could be readily handled by crushing and amalgamation with mercury, so that here also no elaborate organization and no great expenditure of capital were necessary. A third stage was reached when the more easily worked deposits above the water-line had been worked out. Not only were more costly appliances and more elaborately organized efforts required to bring the ore to the surface, but the ore, when obtained, contained less of its gold in the easily recovered, and more in the refractory or combined form. The problem of recovery had now to be attacked by improved mechanical and chemical methods. The sulphides or tellurides with which the gold was associated or combined had to be reduced to a state of minute subdivision by more perfect stamping or grinding, and elaborate precautions were necessary to insure metallic contact between the particles of gold and the solvent mercury. In many cases the amalgamation process failed to extract more than a very moderate proportion of the gold, and the quartz sand or 'tailings,' which still contained the remainder, found its way into creeks and rivers, or remained in heaps on the ground around the batteries. In neighborhoods where fuel was available a preliminary roasting of the ore was resorted to, to oxidize or volatilize the baser metals and set free the gold; or the sulphides, tellurides, etc., were concentrated by washing, and the concentrates were taken to smelting or chlorinating works in some favorable situation where the most elaborate metallurgical methods could be economically applied. Many efforts were also made to apply the solvent action of chlorine directly to the unconcentrated, unroasted ores; but, unfortunately, chlorine is an excellent solvent for other substances besides gold, and in practice it was found that its solvent energy was mainly exercised on the base metals and metalloids, and on the materials of which the apparatus itself was constructed. This practically was the state of matters in 1889, when the use of a dilute solution of cyanide of potassium was first seriously proposed for the extraction of gold from its ores, and the proposal was far from favorably regarded from a chemical point of view, owing to the various difficulties which presented themselves. How each and all of these difficulties have been swept aside, how within little more than a decade this method of gold extraction has spread over the gold-producing countries of the world, now absorbing and now replacing the older processes, but ever carrying all before it—all this is already a twice-told tale which he only felt justified in alluding to as they were then meeting on the Rand, where the infant process made its *debut* nearly fourteen years ago. The Rand to-day is the richest of the world's goldfields, not only in its present capacity, but in its potentialities for the future; twenty years ago its wonderful possibilities were unsuspected, even by experts. In 1889 the world's consumption of cyanide of potassium did not exceed 50 tons per annum. At present the entire consumption of cyanide is not much short of 10,000 tons a year, of which the Transvaal goldfield consumes about one-third. Large cyanide works exist in Great Britain, Germany, France, and America, so that a sure and steady supply of the reagent has been amply provided. In 1894 the price of cyanide in the Transvaal was 2s. per lb.; today it is 8d. Chemistry has so often been called on to play the part of the humble and unrecognized handmaiden to the industrial arts that he might perhaps be pardoned if in this case he called public attention to Cinderella as she shines in her rightful position as the genius of industrial initiation and direction.

Smelter of the Shannon Copper Co., Metcalf, Arizona.

SPECIAL ISSUES of the MINING AND SCIENTIFIC PRESS will be issued fifty-two times per annum, one each week. Each number will contain something useful to mining men, engineers, metallurgists or geologists, no matter how restricted their interests may be.

The Boring of an Oil Well.—II.

ANOTHER LETTER WRITTEN BY A GREEN HAND TO HIS FRIEND AT HOME.

Written for the MINING AND SCIENTIFIC PRESS.

MY DEAR JOHN: You must be under the impression that I am running a correspondence school on well drilling. No, my dear boy, a bullrope is not to tie an animal with. We don't use anything of the bovine species about a drilling well. Some of the men may get a little bullheaded sometimes, but that is all. A bullrope is a rope 2⅜ in. in diameter, and about 100 ft. long.

It runs in a grooved wheel on the side of the bandwheel and from there to the 'tug' wheel on the bullwheels. The belt runs from the engine to the bandwheel and transmits the power to it, and the bullrope transmits the power to the bullwheels. The bullwheels are 7 ft. 6 in. in diameter. The tugwheel is on one end of a 16-ft. shaft and a brakewheel on the other. The brakewheel is what its name implies. It has a brake band around it, fastened to a brake lever and the driller lets the tools in with it, catches them if the bullrope breaks, and a dozen other things. The shaft is about 16 in. in diameter and the cable 'spools' on it.

If anything else worries you, just pass it up to me and I will try and elucidate. I have been here two weeks now and feel that I am pretty well up. Slade says that I know more than I will ten years from today. By the way, John, maybe I was not fortunate in not telling that my 'Governor' was one of the stockholders. If what the drillers say is true, the oil business has been damned by relatives and friends of stockholders. Any relative that has proved a failure in everything else is deemed fit to manage an oil company, or they take that method of getting rid of them.

The last week has been uneventful, so I have not got much to tell. I know why they are so particular about not letting any of the sandpumping get back in the hole (sandpumping is the name used for the earth drilled up and bailed out). If the water gets back into the hole it softens the wall and it caves or sloughs off and it is necessary to case the well. We let the water down to the bottom in the bailer, and then we have a chain on a rope tied inside the bailer, and when the valve lifts in the bottom the chain gets under it and the water runs out.

We are nearly 600 ft. and everything going smoothly; we did lose a bailer once—it caught on the wall and dropped, breaking the sandline. I was speechless, but Slade got a ropespear—a long iron bar with a lot of barbs on it—and screwed it on in place of the bit, and run it down and it caught in the sandline, and we pulled it out.

As we are only expecting to drill 1500 ft., I thought we would be finished in a couple of weeks, but Slade says two months yet. I can't see what's doing. I am a little anxious to 'strike oil.' We are ½ mile ahead of the other developments and every person seems to think it's a case of the fool and his money soon parted.

By the way, John, be sure and tell my Governor not to let the manager know that I am any relation to him.

Your interest in my letters is only exceeded by your nerve in demanding that I write you every Sunday. You seem to think that Sunday is a holiday here, just as it is in your sleepy old town.

I have worked for three Sundays now. If we didn't work our pipe would 'freeze up.' No, it is not so cold as all that, for 'freeze' is only a term to indicate that the sand had settled so solidly around the casing that it would not move up or down. The fine sand settles around the coupling of each joint, which makes a shoulder of nearly an inch on the pipe so we have to pull the pipe up every few hours to keep it free.

When I tell you that we have big triple blocks, about 700 ft. of 1-in. wire line that, woven through the blocks, gives us seven lines in the derrick, and sometimes it is impossible to move the pipe with this power, you may know that it freezes some.

When I wrote you last we were down 600 ft. Well, when Slade and I came on tower Sunday at midnight, we found on running the tools in that the hole was filled up 40 ft., and the walls of the hole were wet. We couldn't understand this until the next day, when the manager came around and said that he had been around Sunday with some friends and had run some water down the hole just to show how it was done. I looked at Slade and he was purple hued with rage. The water had started the walls to sloughing.

Tuesday, when we came on, the other driller had got the tools stuck and the hole had filled up over them. In trying to get loose he had broken the cable. Slade went to the nearest well, about ½ mile away, and got a horn socket and a combination socket. He run the horn socket and chopped up the rope and cavings until he got the neck of the rope socket clean and then run down with the combination socket and it slipped over the neck of the rope socket and when we pulled on it, three things called 'slips' wedged down around the neck, and then we 'hitched on' just as if we were drilling, only the blow was up instead of down. After jarring nearly three hours we got the tools out.

This may sound easy, but when you remember that it was all 600 ft. under ground, and done by suggestions of years of experience, good judgment, and a lot of guess work, it is not so easy.

It puzzles me the sangfroid and aplomb that these fellows possess. They cannot see what they are doing, but they seem to know.

Slade knows just what the tools are doing by looking at the rope, and I am blessed if I can see any difference in the jar, or anything else, but when he says "throw in the rope, she's getting muddy" I always note that the sandpumpings are thick.

Well, we put in about thirty joints of 10-in. pipe —thirty-five lb. to the foot—and after we had gone about 100 ft. deeper we struck water and sand. The drilling was very slow and we had to underream to get the pipe down.

A few days ago a big pebble rolled in alongside of the pipe and dented the bottom joint so that the shoe came off and we had to pull the casing all out to put a new shoe on. Of course, the hole filled up about 100 ft., which had to be redrilled.

The shoe is a piece of steel that goes on the bottom of the casing to protect it. It is slightly larger, outside diameter, than the casing couplings, so that whatever it goes through, the casing will follow.

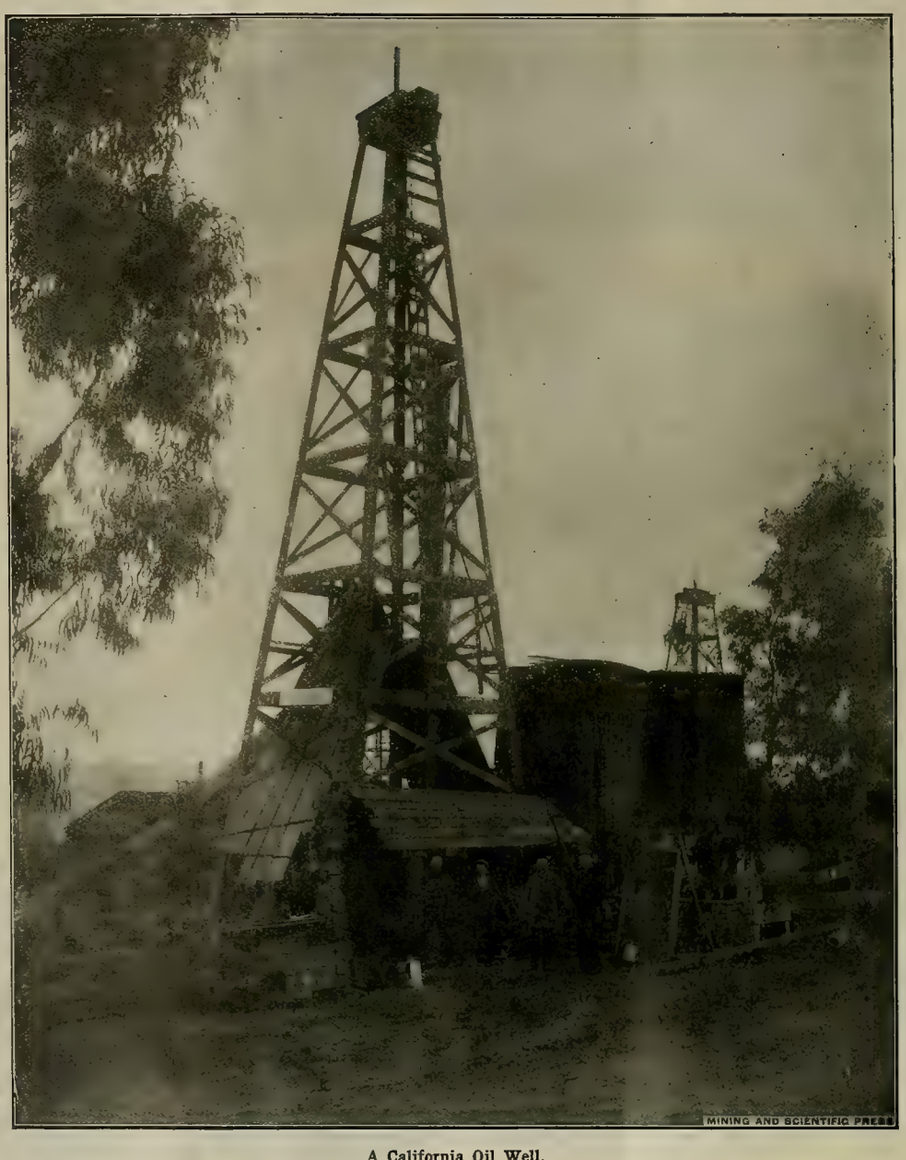
We are close to the oil sand now—if we get it—and expect to get it next week.

Great heavens, John, I cannot describe the workings of all these tools. Get an oilman's encyclopedia and hunt them up. You will be asking what that is, so I will say it is an oilwell supply catalogue, and, as there are something over 500 pages in it and three or four times as many illustrations, you may realize why I cannot describe the whole thing in a letter.

The underreamer is a tool that spreads out when it gets under the casing and shaves off the sides of the hole already drilled, so that the casing will go down.

No, I have not struck oil. You know your Burns and the oil business is something that can not be planned on paper.

We got the casing 'froze' and broke the calf-wheel. We run 2,000 feet of cable off the bullwheels, put our calf line on the bullwheels and pulled the top of the derrick so nearly in that it had to be reinforced. By that time the pipe was so tight that the other driller and the manager were ready to run in another string of smaller casing, but Slade stuck to it, got the pipe working 1 in., then 2 in. then a foot, and finally loose. We are in the sulphur water on top of the clay that is over the oil. *We may get oil next week.* Yours, JIM.



A California Oil Well.

THE explosion of a homogeneous substance is due to a decomposition, that is, a chemical reaction in the interior of the substance, and is generally brought about by a violent shock caused through the detonation of a primer, commonly called the detonator. Any energy resulting either from the shock of an exploding primer or a heavy blow will, if resistance be encountered, be transformed into heat. This transformation will, owing to the suddenness of the shock, take place in the first layers reached. Assuming that the heat thus developed is high enough to decompose this thin layer of substance, the sudden formation of great quantities of gas will produce a new shock, which will doubtless be more violent than the original one. The resistance of the surrounding layers will change the energy of the new shock again into heat, which in turn will cause the decomposition of another quantity of the explosive and so on, until the whole mass of it is exploded. It will thus be seen that if the energy developed by the decomposition of the first portions communicates itself to the neighboring parts, so as to determine step by step the decomposition of the whole mass, we shall obtain a complete detonation as the result of the shock.—E. H. Weiskopf, *Chem. Met. Soc. of South Africa.*

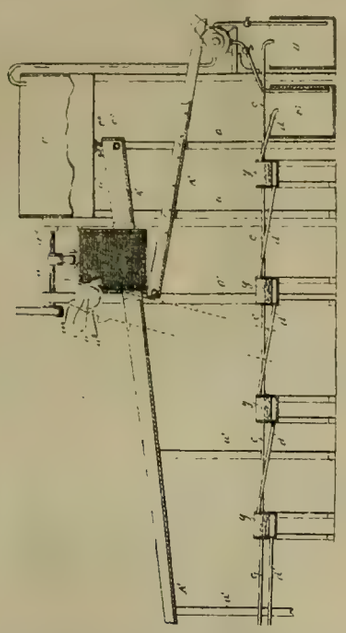
THE new steamship *Amerika* of the Hamburg-American line is the largest boat afloat, as regards her displacement of 40,000 tons. She is 700 ft. long and 74 ft. wide. The *Baltic* is 725 ft. long and 75 ft. wide, so that as regards dimensions the *Baltic* is still first on the seas. The *Amerika* can carry 16,000 tons of cargo and accommodates 23,057 passengers, not including the crew of 520 men. She is propelled by twin screws driven by quadruple-expansion engines, calculated to give a speed of 18 knots, so as to make the crossing from New York to England in about seven days.

Mining and Metallurgical Patents.

PATENTS ISSUED DECEMBER 12, 1905.

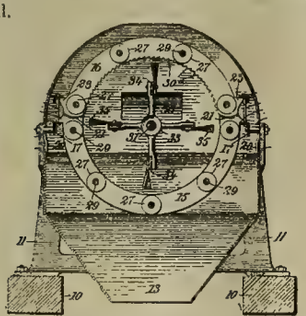
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINING MILL.—No. 806,145; F. J. Hoyt, Chicago, Ill.



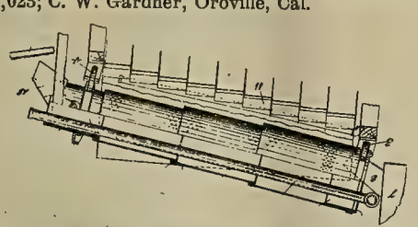
In mining apparatus, combination in one structure of shaking screen, chemical sluiceway, both inclined, latter placed directly under screen, and both joined at their heads at point of ore and chemical solution supplies, amalgamating apparatus forming part of same structure and receiving run both from screen and sluiceway, sluiceway having extension beyond amalgamator, revolving tail screen at end of extension, tail tank for receiving solution, over which screen revolves, receiving tanks under head of machine, return pipes from tail tank to head tanks, zinc vats on line of pipes in which solution is precipitated on way back to head, and pumping means to pump solution from head tank or tanks back to original supply tank, whereby continuous constant operation of mill and continuing circulation of solution around mill are obtained.

PULVERIZER.—No. 807,136; Nickolas Spurgin, Ottawa, Ill.



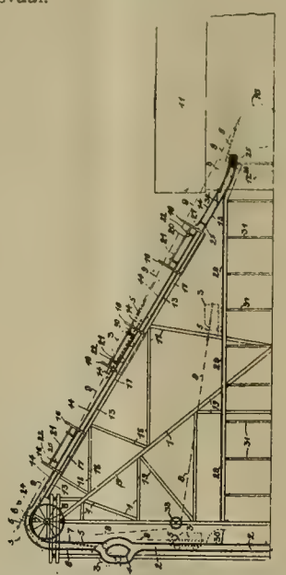
In pulverizer, combination with chamber comprising series of rings tapered outwardly throughout peripheries and having integral bosses extending from tapered portions, bosses being provided with openings, of tie-rods extending through boss-openings and serving to draw outer faces of bosses to a bearing, and beater rotatable within chamber.

GOLD WASHING AND SEPARATING SCREEN.—No. 807,023; C. W. Gardner, Oroville, Cal.



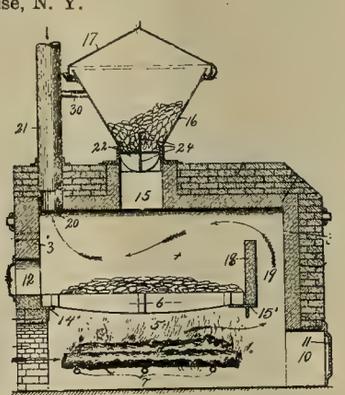
Inclined, tubular, revoluble screen consisting of perforated metallic sections of gradually decreasing diameter, sections each having uniform diameter from end to end and having overlapping meeting ends, rings to which meeting ends of sections are secured, rings forming dams adapted to retard passage of material and cause same to overflow into smaller succeeding sections, tread-bands surrounding screen, rollers upon which bands are supported and through which motion is transmitted to screen, and thrust-bearing rollers adapted to prevent longitudinal movement of screen in direction of its axis.

WINDING OR HAULING APPARATUS FOR MINES AND THE LIKE.—No. 806,857; E. G. Weldon, Johannesburg, Transvaal.



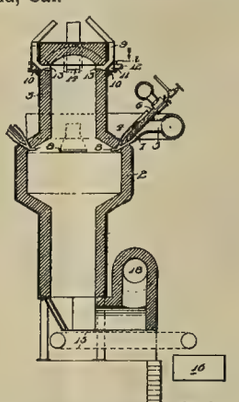
In winding or hauling apparatus of nature specified, combination with head gear and pulley wheel, round which hauling rope passes, of track for skip or cage passing over head gear and pulley and extending in direction of pull of hauling rope, and connections for drawing skip or cage past parts as far as desired and freely thereof.

REDUCTION FURNACE.—No. 806,127; F. W. Field, Syracuse, N. Y.



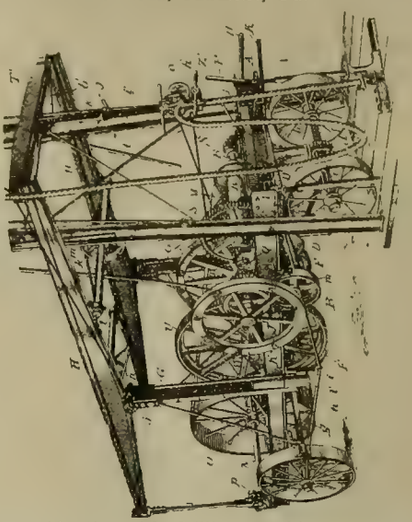
Furnace comprising front and rear walls, side walls, top and bottom, front wall having transverse ledge on inner side thereof, T iron having portion of its head on one side of web seating on ledge and having web engaging front wall, second T iron secured to side walls and spaced from rear wall, grate seating on head of first named iron and on portion of head of second named iron, and transverse wall seating on remainder of head of second iron and extending considerably above grate.

PROCESS OF TREATING ORES.—No. 806,774; H. F. Brown, Oakland, Cal.



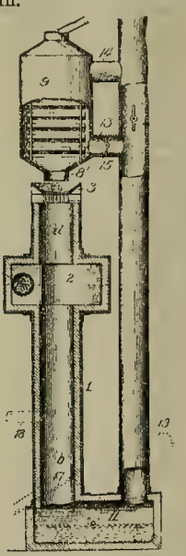
Process for treating finely divided iron ores which consists in reducing same while in atmospheric suspension and during such suspension causing reduced particles to agglomerate into clinker, bonding of ore being caused by resultant spongy condition thereof.

PORTABLE DRILLING MACHINE.—No. 806,886; H. S. Glenn and C. E. Glenn, Oakmont, Pa.



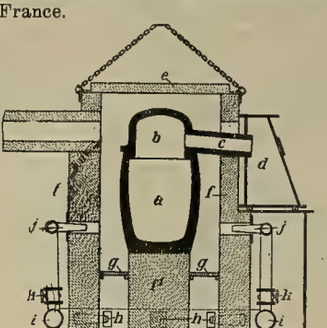
In combination with drilling machine, comprising main frame, engine, walking-beam, drill rope drum, sand-pump rope drum, casing rotating drum, and brakes for drill rope and sand pump rope drums; levers H′, K′, L′ and P′, serving to control movements of walking-beam, drill-rope drum, sand-pump-rope drum, and casing-rotating drum, all brought into close proximity at forward end of machine, whereby driller without leaving his drilling position is enabled to manipulate levers and control several mechanisms.

PROCESS OF REDUCING ORES.—No. 12,424; H. F. Brown, Chicago, Ill.



Process of treating finely divided ore, which consists in subjecting it, while in atmospheric suspension, to preliminary heating atmosphere, then to action of reducing, fusing frame and at same time gradually bringing particles of ore into approximate physical contact.

PROCESS OF EXTRACTING METALS FROM THEIR SULPHIDES.—No. 807,271; A. H. Imbert, Grand Montrouge, France.



Process of extracting zinc and lead from complex ore containing blende and galena, consisting in adding to ore necessary copper and fluxes; in heating mixture to vaporization temperature of zinc, but maintaining lead at temperature below vaporizing point of latter metal, in condensing vaporized zinc and drawing off the molten lead; in separating the resulting scoriæ and copper sulphide; and in recovering copper from sulphide, in order that it may be used over again.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

TORONTO, January 2, 1906.

Notwithstanding that the prospecting season is closed owing to severe winter weather, interest in the Cobalt mining area continues unabated, being stimulated by frequent reports of rich finds of silver-cobalt ore in the mines now in operation. Recently a mass of almost pure silver weighing 250 lb., accompanied by two smaller nuggets of about 30 lb. each, was found on a property owned by A. M. Wylie, of Port Arthur, and J. B. Pardee, of Sault Ste. Marie, near the celebrated University mine. The question of the permanency of the camp occupies the attention of mining men and scientific experts, doubts having been expressed as to whether the rich deposits would hold to a lower level. Among the mineralogists who have lately studied the field with this end in view are Dr. Robert Bell, of the Dominion Geological Survey, and Prof. Hidden, of Newark, N. J., who have not yet announced any definite conclusions on the subject. A diamond drill employed for the purpose of testing the depth of the vein in La Rose mine had, at last accounts, reached a depth of 340 ft. and found the ore as rich as that near the surface. It would hardly be safe, however, to draw any general conclusions from this encouraging result. Prof. W. G. Miller, Provincial Geologist of Ontario, states in his recent report on the field that the veins, which occur in the Lower Huronian formation, do not appear to cut through the older Keewatin series, which underlies it unevenly. The depth to which a vein may descend therefore depends upon whether the formation occupies an old valley of underlying Keewatin, or lies above a former hilltop. Actual mining appears to be the only means of arriving at a conclusion.

According to a statement issued by the Ontario Bureau of Mines covering the first nine months of 1905, the total shipments from the silver-cobalt mines for this period amounted to 2,400,000 oz. silver valued at $1,300,000; the other valuable constituents of the ore—cobalt, nickel and arsenic—being worth $83,500. The metals other than silver are placed at a low valuation because, in the absence of smelting facilities the ore has to be shipped to New York for treatment and few of the buyers allow anything for the cobalt, nickel and arsenic contents, alleging the refractory character of the ore as an excuse. About 25 properties are now being actively worked in the Cobalt area. The opening of spring will undoubtedly witness a great rush and a considerable extension of the field, especially to the north, railroad extension having given access to a new district supposed to be as rich as that around Cobalt. The Temiskaming & Northern Ontario Railway, a government line now in course of construction, has reached a point 40 miles north of New Liskeard, lately the terminus. The investigations of Dr. W. A. Parks, of the Dominion Geological Survey, in the district lying north of Lake Temiskaming, establish the fact that while the metalliferous rocks of the present scene of operations are interrupted to the north by other formations, beyond these again there occur extensive deposits of a similar character to those of the Cobalt area. Some claims have indeed already been taken up, and it anticipated that the district along the route of the railway will witness a great influx of prospectors and mining men. The undoubtedly rich tract immediately to the south is at present forbidden ground to prospectors, as 60,000 acres is included in the extensive timber limit of Gillies Bros., and according to the present regulations it is not open to location. Several valuable finds have been made there and strong pressure has been brought to bear upon the government to have it opened to prospectors.

In December a conference of mining men was held here at the request of the Provincial government in order to ascertain the views of those connected with the mining industry, respecting proposed changes in the mining law. Recent developments and the growing importance of mining have rendered necessary a complete revision of the system. The attendance, numbering about 120, was thoroughly representative of the different mining districts. The conference lasted four days, closing on December 15. Prominent among the questions considered was that of the restrictions on prospecting under which the public lands under timber licenses and the forest reserves are closed to prospectors. A resolution was adopted expressing the opinion that all public lands, whether timbered or otherwise, should be open to location. Another matter on which the conference was practically unanimous was that prospectors should be allowed to locate without having made any actual discovery of valuable mineral. At present no claim for a location can be received unless evidence of such a discovery is furnished. A resolution in favor of permitting location without this condition was adopted, it being provided, however, that the locator must, within 90 days, expend $100 on his claim in actual mining development, the expenditure being calculated on the basis of $3 per day for a man's work. The abolition of all royalty, or special tax on mining, was urged. Hon. Frank Cochrane, Minister of Lands & Mines, to whom the resolutions were presented, stated that they would have great weight with the government.

In amending the law, the government has an intricate problem to face, especially in regard to the conflicting claims of the miners and the lumber operators, who hold large areas of timbered land under license. The title to the soil remains vested in the government, all that the lumbermen got being the right to cut the timber. The latter, however, are strongly opposed to any proposal to give prospectors the right to locate within their limits, alleging that to throw the timbered lands open to mining would greatly increase the danger of forest fires. As the sales of timber furnish the largest source of provincial revenue, it is hardly likely that any such sweeping change as that recommended by the conference can be carried out, though something may doubtless be done in individual cases, such as that of the Gillies limit near Cobalt, where veins of exceptional richness exist, to permit of mines being opened.

ALASKA.

Consul Ravndal of Dawson, Yukon, finds that the total output of gold in Alaska for the season of 1904–5 exceeded $14,000,000, as compared with $9,067,325 for 1903–4, and as against $6,352,028 for 1902–3.

ARIZONA.

On December 28, in Phœnix, the organization of the Arizona Miners' Association was completed. The by-laws are patterned after those of the California association. After organization, C. M. Shannon of Clifton was elected president; E. Randolph, president; C. H. Akers, secretary; Wm. H. Brophy of Bisbee, treasurer. After the adoption of the report of the resolutions committee the chair named the following as members of the executive committee: A. E. Haggett, Yavapai; Lamar Cobb, Graham; A. H. Smith, Mohave; S. L. Gibson, Gila; C. M. Clark, Maricopa; W. P. Twitchell, Pinal; Mr. Forbes, Pima; E. L. Crowell, Santa Cruz; Walter Douglas, Cochise; Mr. Burbage, Navajo; T. E. Pollock, Coconino, and J. T. Hogue, Apache.

Graham County.

The report of the Shannon Copper Co. of Clifton for the year ending Aug. 31, 1905, shows that development during the year covered 11,931 ft. at an average cost of $3.46 per ft.; 2,810 ft. was in the vertical direction and cost $3.27 per ft.; of the whole distance, 3,352 ft. was in ore. Some of the old stopes have been exhausted, but additions to reserve have more than kept pace with extraction. A gradual decline in its value is indicated by a less proportion of smelting ore and by a smaller amount of copper in it. The whole output of ore from the Shannon mine was 188,856 tons; its average content was 4.08% copper. Smelting ore, carrying 5.15% copper, constituted 53,353 tons, or 28% of the whole. Concentrating ore, carrying 3.66% copper, to the amount of 135,503 tons, showed a gain of 48% over its proportion in the preceding year's output. The levels below the Boulder tunnel accounted for the increased extraction, all stopes above that level having reduced their outputs. Ore from the open cuts, carrying only 2.2% copper, is mined for an iron flux, but only in quantities required by the smelter. The cost per ton for mining 188,856 tons was $2.138, the leading items being: Mining, 93.2c.; timbering, 50.1c.; tramming, 11.2c.; development and exploration, 21.7c.; filling, 5.6c.; sampling and assaying, 4.8c. One of the company's outlying claims, the El Paso, contributed 279 tons of ore carrying 15.5% of copper. This group is being explored by a tunnel along the limestone contact. The mill was running only two-thirds of the time, owing largely to interruptions in transport, due to heavy floods. Crude ore is now being screened before crushing, and the fines are briquetted to save excessive losses of oxidized ore in the mill; magnetic concentration and picking the ore are expected to reduce losses of these oxides in the tailing. The mine product is classified into two grades, the higher being smelted at once, and the lower being concentrated before smelting. The furnace put through a charge of 128,724 tons in the course of the year; it was made up of 52,926 tons of Shannon ore; 3,519 tons of custom ore; 29,735 tons of concentrate; 3,831 tons of fine ore; 12,949 tons of flue-dust, and 975 tons of copper slag. A converter plant is under construction, and a blower engine and other plant were added during the year. For converting matte, the company has heretofore depended upon its neighbors. The year's output was 11,414,271 lb. fine copper as against 10,788,891 tons in the previous year. Of gold, 592 oz. and of silver 17,127 oz. were sold. The average price received for copper was 14.24c. per lb. The gross proceeds of sales were $1,631,317, and stock of metal was increased by $60,177; operating expenses were $1,126,248 (9.87c. per lb.), construction and development to the amount of $52,321 was charged against earnings, and selling and miscellaneous general expenses were $241,772, showing a net profit of $271,153 on the year's work. Expenditures of $45,650 were charged to capital for permanent improvements.

Maricopa County.

The miners' drilling contest at the Arizona territorial fair resulted as follows, contestants drilling 15 minutes each: Double-hand drill team of Ross & McIvy, 40⅞ in., Page Bros., 39⅞ in. The latter team earned the championship at El Paso. Fred Yockey won the single-hand contest, drilling a fraction over 21 inches.

Mohave County.

(Special Correspondence).—The West Gold Road Mining Co., at Acme, have suspended work, pending equipment and increased operations, as they have struck the ledge at a depth of 260 ft. J. D. Spargo of Acme has been superintendent.

Acme, Jan. 2.

On the 300 level of the Vanderbilt mine, at Cerbat, the drifts are in rich gold ore.——E. F. Thompson has let a contract to sink the shaft on the Idaho mine, Cerbat, 50 ft. deeper.

The Kingman Smelting & Refining Co. has leased ground at Kingman on which to build a 250-ton smelter and 400-ton sampling works. Walter De Varilla is general manager.

Yavapai County.

At the 10-Spot claim of the Senator mine, near Prescott, a hoist is being put in to aid in connecting the shaft, now 250 ft. deep, with the Senator tunnel. An upraise will also be made from the tunnel. A. J. Pickerell is superintendent.——Development is to be resumed at the Storm Cloud mine, south of Prescott, by H. J. Beemer.

Judge Kent has decided the Old Vulture mine case in favor of the old owners. The mines at Wickenburg have been under the control of a watchman who was supposed to do the assessment work on them, but it is alleged that this he failed to do and they were relocated. The proof was made that with one exception the work had been done and the old company was quieted in its title to the property. It is now probable that the mines will be worked.——The Monarch Mining Co. intends to install electric machinery to furnish power and lights for the reduction plant. The power plant will be on the Hassayampa river between Wickenburg and Hot Springs Junction. C. W. Platt of Wickenburg is superintendent and J. B. Tomlinson of Prescott consulting engineer.

CALIFORNIA.

Amador County.

A big cave is reported from the Keystone mine at Amador City, from the 450 or 500 level to the surface near the north shaft.

El Dorado County.

The Stillwagon mine, near Grizzly Flat, is being reopened, under the direction of F. Davis.——The Wagner mine, near Lotus, is being opened up by J. B. Wagner.

Inyo County.

The Bishop Creek Consolidated Mines Co., which owns a low-grade gold property at the head of Bishop Creek, has begun development work under the management of R. T. Jones.

Madera County.

The Texas Flat mine, ½ mile west of Coarse Gold, is being operated under the direction of Wm. Lawrence. The 20-stamp mill has been started recently.——McKenzie & Rule are driving a tunnel to develop the Consolidated Four claims, near Coarse Gold.——A road is to be built to the Zulu mine, on French gulch, two miles from Coarse Gold. Machinery is to be put in.——Work has been stopped at the Westfall mine for the winter.

Mono County.

Papers have been signed between Boone, Carpenter, Montrose and Parker, comprising the Myrtle & Julia Co., and J. K. Weitfle and S. C. Eastwood of the No. 1 Pittsburg lease, wherein Weitfle & Eastwood are granted a five-year lease on ground in the Masonic townsite, near Bodie. This piece of ground was leased as a millsite and on it will be built a quartz-mill for the reduction of ores from the present W. & E. lease and custom rock.

Placer County.

It is reported that the Kittler mine, near Ophir, is to be opened up by Chas. Peach of San Francisco.

Plumas County.

It is reported that a rich strike has been made by H. Bicknell, of Los Angeles, and associates, 3½ miles north of the Duncan mines, near Greenville.

Santa Barbara County.

The Santa Maria chamber of commerce has issued a statement in reference to the oil production of the Santa Maria and Lompoc districts for 1905, compiled by Secretary L. E. Blochman. This places the total at 5,300,000, which is much higher than previous estimates. The estimated production in barrels, with estimated storage accompanying, for producing companies. is as follows: Union Oil Co. (including California Coast and S. M. Oil & Gas Co.), 3,500,000; storage, 1,000,000. Pinal Oil Co., 350,000; storage, 150,000. Brookshire Oil Co., 50,000; storage, 25,000. Santa Maria Oil Co. (Kaiser), 25,000; storage, 5,000. Hall & Hall, 25,000; storage, 5,000. Western Union Oil Co., 1,000,000; storage, 200,000. Graciosa Oil Co., 250,000; storage 25,000. Totals, 5,300,000; storage, 1,310,000. Of the above storage, over one-third is temporary in local tanks for engaged deliveries, and so only about 800,000 barrels is actual storage on hand. The number of producing wells is as follows: Union, including California Coast and Santa Maria Oil & Gas Co., 25; Pinal, 10; Brookshire 5; Santa Maria Oil Co. (Kaiser), 1; Hall & Hall, 1; Western Union, 25; Graciosa, 5; Los Alamos, 1. The number of wells drilling is as follows: Union, including California Coast and Santa Maria Oil & Gas Co., 20; Pinal, 1; Brookshire, 1; Pennsylvania Petroleum, 1; Rice Ranch, 1; Coblentz, 1; Goodwin & Tietzen, 1; Radium 1; Western Union, 5; Graciosa, 1; Cat Canyon district, 1; Palmer, 1; Recruit (Associated), 1; Pacific Oil & Transportation, 1; Escolle lease, 1; Newhall lease, 1; Syndicate, 1; Claremont (Union), 1; Southern Pacific, 1. The total number of producing wells is 73, drilling 42.

Shasta County.

The Uncle Sam gold mine on Squaw creek, eight miles west of Kennett, is being worked, under the direction of Superintendent Varden. The 20-stamp mill has been started.——The aerial tramway, which conveys the ore from the Mammoth mine 2½ miles to the smelter, has been put in operation. The timber is carried up to the mine by the excess weight of the ore coming down. The ropeway has a capacity of 1,000 tons daily. The excess of 100 h.p. will be used to run air compressors at the mines.

Tuolumne County.

(Special Correspondence).—Wm. Sharwood has bonded the Soulsby mine at Soulsbyville to Eastern people, who will sink the south or Pennsylvania shaft 300 ft. deeper and unwater and reopen the old Davidson shaft and sink it to the same level as the Pennsylvania. The two shafts are to be connected from the bottom level.

Soulsbyville, Jan. 2.

Trinity County.

The first payment has been made on a bond held by Eastern capitalists on the Paulsen placer claims, near Douglas City, seven miles below Weaverville. The group includes the Dutton's Creek mine, the Union Hill and the Last Chance. Water to work the mine will be taken out of Grass Valley creek. The conduit for carrying it across the canyon will be an inverted siphon of 600 ft. depression. The cost of equipping the mine for hydraulicking will be great.

Yuba County.

The Bear River Dredging Company, near Wheatland, is preparing to enlarge its plants by having two more dredgers built.

COLORADO.

(Special Correspondence).—During the coming year a number of large enterprises are contemplated and several of them are under way in this State. The Moffat road is being pushed as rapidly as conditions will permit. Work is now progressing in Gore canyon, over which there has been a controversy between the road and the Government. This obstacle has been removed and things are progressing. It is understood that the big tunnel to pierce the Mosquito range between Alma, in Park county, and Leadville, in Lake county, has been financed, and work will commence in the spring as soon as the weather will permit. This project, if carried through to completion, will mean considerable to the two counties mentioned, as well as the State at large. The projected Vidler tunnel, above Georgetown, in Clear Creek county, is also reported about ready to commence on a large scale. Considerable work has already been done on this tunnel, which expects to connect the railroads at Georgetown and Keystone, on the western slope of the Continental divide. This tunnel is to be used as railroad as well as mining. On account of the heavy snowfall in the San Juan country near Silverton, buildings of different kinds have been abandoned. The Gold Prince mill at Animas Forks has to be abandoned, as the railroad was unable to deliver the freight necessary to keep the work moving. Work will be commenced in the spring as soon as possible.

Denver, Dec. 30.

Clear Creek County.

In the Schraga property, up Banner gulch, on Chactaw mountain, near Georgetown, a lode was cut 800 ft. from the portal of the crosscut tunnel. Drifting has been started. The property has been operated by William Schraga.

The Georgetown Loop M. Co. has been formed to work claims on Republican mountain, between Silver Plume and Georgetown. Geo. Albertson of Denver is president. The company intends to put in machinery to continue their tunnel for 2,000 ft. to open the veins.——The Dives-Pelican mill is to be started on high-grade ore from the Bismark mine.——A strike of high-grade ore is reported from the Aspen Promise group, on Leavenworth mountain, which is being worked by the Silver Plume M. Co. Ed. Butts is superintendent.

The Key West mine on Leavenworth mountain, near Georgetown, is to be worked by a new company, of which E. W. Shepard is manager. The value is chiefly in silver and in zinc.——The heading of the Central tunnel is in 4500 feet.

In reviewing tunnel progress the Georgetown *Courier* states that the Vidler tunnel in East Argentine, which recently installed a fine power plant, is being pushed through the main range, to be used for mining and railway purposes. The company contemplates installing another plant of machinery on the opposite side of the range next summer and driving the tunnel from both ends.——The Wilcox or Argentine tunnel, owned by the Waldorf Co., will open at depths varying from 1,000 to 2,500 ft. many claims. At the last meeting it was decided to construct a tunnel from the Silver Plume side of the mountain, 12,000 ft. in length, to intersect 1,500 ft. below the present workings.——The Sidney tunnel is driven to cut at great depth a number of rich veins on Pendleton mountain. The company installed a plant which is driven by water power, enabling them to drive their tunnel at less cost per foot than any other tunnel in the county.——The Leavenworth Mountain and Domino Companies are driving tunnels to intersect their holdings on Payne's Peak.——The St. Paul Co. has put in machinery to drive a tunnel 1,500 ft. to open claims.——The Silver Plume Co. has adopted the tunnel system and is pushing the Butts tunnel to cut the Rising Sun and other lodes on Leavenworth mountain.——Negotiations are pending whereby the Doric tunnel, which has been driven into Griffith mountain over 3,000 ft., will probably be in use again to work the Griffith and other mines.——The Kelly tunnel, which has been driven into Democrat mountain 3,200 ft., will soon pass to the control of the Democrat Mountain Co.——The Joplin tunnel, being run by B. J. O'Connel to develop the Gambetta and other lodes, is in 100 ft.——The Scepter tunnel, owned by the Red Oak Co., is being driven to get under ore shoots on the Sunburst.——The Prudential and Montgomery Ward tunnels on Republican mountain are each in 400 ft.——The Lincoln mountain and the Ramsdale tunnels have been driven a little more than 400 ft. each.——The Empire tunnel, driven to cut all the veins of the Empire district, is in 3,000 ft.——The several Santiago tunnels, driven to develop the Santiago mine at various levels, aggregate 2,300 feet. Among the older tunnels are the following: The Burleigh, the first long tunnel run in the State, is in 2,400 ft.; Diamond tunnel, 2,000 ft.; Ashby, 2,200 ft.; Snowdrift, 600; Baltimore, 800; Helmick, 600; Lebanon, 1,000; Republican Mountain, 800; Pulaski, 800; Eclipse, 1,000; Bonanza, 1,000; Hidden Treasure, 1,000; Hall, 3,000; Central Colorado, 600; Cosmos, 1,200; Abeel, 700; Empress, 3,000; Conqueror, 600; Sturm, 600; Capital Prize, 1,800. The Two-and-a-half tunnel and level on the Pelican is the longest in this district, being one and one-half miles.

Gilpin County.

The output of Gilpin county mines for 1905 is 25% higher than that of 1904, owing to closer sorting of the ores sent to the mills and smelters. Many new shaft buildings have been put up and much new machinery put in. Several properties that have been inactive for some time will be started up in the new year. Five new mills are under construction. The Running Lode, Old Town, Pittsburg, East Nottaway, Alps and other properties have been paying dividends during 1904. The leasing system has been broadened. The results are seen in the increased tonnages of mineral and the number of producing mines. The Pleasant Valley Mining & Milling Co., operating veins on the Banta ranch, has the Hill shaft down 420 ft. When the mine has been unwatered to the 250-ft. level ore-breaking is to be started. From the 350-ft. level drifts will be run southwest to the Black Cat, Margaret and American Flag lodes. The Gold lode has been unwatered and will be piped from the Hill shaft to operate machine drills. On the Clive shaft a new shaft-building has been put up and may be worked under lease. The first unit of the company's new concentrator is expected to be completed by February 1. The total capacity of the completed two units will be 100 tons daily. It is expected that the Gilpin Tramway lines will be completed 3½ miles from Willis gulch to the mines by the end of the month.——The Colorado & Southern, owning the ore tramway system, has extended its tracks to every prominent mine not touched by the previous management. Improved concentration has taken the place of imperfect methods.

The Forks & Randall extension claims on Quartz hill, Nevada district, near Central City, are to be equipped with a hoist and new shaft-house. The shaft, now 350 ft., is to go deeper.——Bids are being asked for sinking the Grand Central on Gunnell hill, Central City, 200 ft. farther, the shaft being down 400 ft.——Hawn, Stephenson & Horning are putting up a 15-stamp mill in South Moon gulch, near Rollinsville, to handle the ore of the Smuggler mine, which has been developed by a 300-ft. tunnel.

The Nancy Hanks, northeast of Apex, is developed by two tunnels. W. D. Converse is owner.——The Mary property, on Silver creek, is being developed by J. F. Colby. It is reported that machinery for shaft sinking is to be placed on the Palace claims, west of Silver creek.

The following list of Gilpin county stamp mills is taken from the *Register-Call:*

Mills. Location.	Stamps—Slow	Stamps—Rapid
Climax, Black Hawk	25	..
Fullerton, Black Hawk	33	..
Hidden Treasure, Black Hawk	75	10
Meade, Black Hawk	40	..
Polar Star, Black Hawk	40	..
Eagle, Black Hawk	..	35
Boston & Denver, Black Hawk	..	80
Gilpin, Black Hawk	50	..
Rocky Mountain, Black Hawk	25	..
New York, Black Hawk	50	20
Randolph, Black Hawk	50	..
Penn, Black Hawk	50	..
Iron City, Black Hawk	..	25
Bonanza, Chase Gulch	25	..
Gregory-Buell, Mountain City	..	45
Perigo, Gambell Gulch	..	25
Gold Dirt, Gambell Gulch	..	25
Monarch, Gambell Gulch	10	..
Peterson, Lump Gulch	15	..
Avon, Nevada Gulch	..	30
Mountz & Pal., Pine Creek	..	10
Blue Grass, Phœnix	..	10
Caledonia, Wide Awake	10	..
Totals	498	325

Gunnison County.

A. E. Sanders, superintendent and general manager of the Lanyon Zinc Co., operating north of Pitkin, has struck a 3-in. pay streak of zinc and silver ore.——The Ben Franklin mine and mill, near Pitkin, are being worked by A. B. Clark.

Lake County.

At the bottom level, 950 ft. below the surface a drift is being run from the Penrose shaft north toward the Coronado. The drift will be 125 ft. below the bottom of the Coronado, and an upraise will be made to make a bottom connection. When this is completed hoisting can be done at either shaft or from both mines.——The tunnel connecting the Adams and Wolftone shafts at Leadville is almost completed. It will be 515 ft. long.

During the coming year Leadville will ship manganese ore. A contract has been made with the Illinois Steel Co. for 20,000 tons from the Gray Eagle mine under the control of the Western Mining Co. This shaft, east of the Penrose mine, has been idle a number of years. It is known to contain a large body of manganese, but the demand ceased for this product several years ago and since then the property has been idle. The contract with the Western Mining Co. calls for 15,000 tons, and G. W. Cook will secure 5,000 additional from other properties.

The close of 1905 finds mining in Lake county in a more prosperous condition than it has been for years, according to the Denver *Post*. The older properties in the Leadville section are producing more ore and of a better grade. At the Coronado an immense body of lead silicious ore has been opened. The present output is 300 tons daily.——After a hard fight for over 10 months against water, the Penrose shaft was sunk to a depth of nearly 950 ft., and at the bottom station three large pumps were installed, with a capacity of 2,500 gallons of water per minute, sufficient to control the entire inflow from the down-town section. When all the connections are made with the different properties owned by the Western Mining Co. in this basin, this shaft will be used as the principal pumping shaft, all the water being diverted to it, thereby lessening the cost of mining at the other properties.——During the year the Cloud City, to the west of the Midas, has deepened its shaft several hundred feet; also that of the Home Extension, made connections between the two, and is now developing a large body of iron.——The Bohn shaft, on East Second street, that started up a few weeks ago, is sinking to catch the Coronado ore shoot to the south.——In the Poverty Flats section several properties are working, and a few of them shipping iron. The Northern is turning out 125 tons daily. Other mines are sinking and prospecting for the Fryer hill shoots that trend through this section.——The monthly output of the Yak tunnel is 8,000 tons, coming from the Silver Cord, Bob Ingersoll and Tankerstown. The mill turns out 200 tons of concentrates daily.——Property owners on Iron, Breece and Jonny hills are running laterals from the tunnel to their mines. In 1906 the tunnel may be driven to Big Evans basin to drain the whole of that section.——The two great zinc producers of the camp are the Moyer, belonging to the Iron, Silver Mountain Co., and the A. Y. and Minnie, owned by Graham & Guggenheim. The total output for all classes this year will be close to 150,000 tons. The production of zinc will average 10,000 tons per month, the balance being iron, copper, and lead sulphide.——The Tucson, the extension of the Moyer to the east, is sinking a large shaft to a depth of 1,000 feet. The diamond drill went through ore 185 feet thick. The average output of zinc from the A. Y. and Minnie is 8,000 tons per month, with 2,000 tons of crude ore.——On Rock hill ore has been opened at the Murphy shaft, the Dome and Sequin. At the Bessie Wilgus the results have been less satisfactory. The output from the Reindeer will average 80 tons a day for the year.——The Nil Desperandum in the lower level is in iron. The Columbia is shipping an average of 20 tons daily. At lower Rock hill the only shaft now at work is the Mike, which is down 550 feet. Another 100 ft. should bring it well into the contact, when drifting will be started. The total tonnage for the year will be over 900,000 tons, and the value will come close to $13,000,000.

Summit County.

The estimated value of Summit county's mineral for 1905 was $815,000; gold, $301,000; silver, $239,000; lead, $123,500; zinc, $128,500; copper, $8,000; and crude iron, $15,000.

In an annual review the Summit county *Journal* states that the Banner placer, near Breckenridge, under Manager Kingsbury, has put in storage reservoirs, ditches and roads; 4,500 ft of 24-in. and 22-in. steel placer pipe, with lateral pipes to three giants and to an electric light and power plant, have been placed in position, and a two-months' run on the gravel has been made. The giants play on the 18 to 40-ft. banks under a pressure of a 308-ft. head. The alluvium passes through a sluice four feet wide, lined with self-clearing angle-bar riffles that save flour and coarse gold. A concentrating plant has been put in to make a smelting product of the heavy black sand saved by the under currents. The Revett dredge boat of the Reliance Gold Dredging Co. was completed during the summer, and has fulfilled the expectations as to capacity and adaptation. With 44 buckets a continuous stream of gravel is poured into the sizing and revolving screens. After screening (to remove boulders larger than four inches in diameter), a centrifugal pump discharges the material into a set of sluices lined with manganese-steel riffles, which retain the gold. The working season for dredging in Summit county is said to be 250 days per year; the capacity of the dredger is stated to be 3,000 cu. yd.——The American Gold Dredging Co. operated the Peabody and its other high-bar placers during the season, and drilled to locate the old channel of the Swan river for next season's dredging.——The Salt Lick placers, near Dillon, and additional territory, making 1,560 acres, have been consolidated and will be operated next season by the Buffalo Placer M. & M. Co.——The Mekka Gold Mines Co., operating on placer ground in French gulch, continued the construction of its long-drainage sluice toward the old elevator pit, and, on its way, worked off a bar that is said to have yielded $25,000. This drainage-sluice is being constructed to operate the big pit with giants. Mark G. Evans of Denver is manager.

The old Union M. & M. Co. is driving a crosscut tunnel which is in over 1,210 ft. and but 300 ft. more are required to bring it under No. 2 shaft. The mill has proved itself adapted to concentration and separation of the values in low-grade ore and is shipping about two carloads of its zinc, lead and iron products per day. Manager A. E. Keables supervises the mill work, and George C. Smith controls the mine. The Colorado & Wyoming, on Mineral hill, has produced the heaviest tonnage of lead and zinc ore of any mine in the county. The crude zinc now nets the owners $12 per ton on board cars in Breckenridge.——The Abundance Gold M. & M. Co., on Mineral hill, during the year erected a good hoisting and pumping plant, sank a shaft 255 ft., drifted 300 ft., and is now driving a tunnel to be 1,200 ft. long and to cut the vein at a depth of 575 ft. from the surface. John G. Goodier is manager.——The Beaver Creek Gold M. & M. Co. has put the Lucky mine on the list of active shippers of smelting ore. The main working shaft is to be put down 100 ft. and a new level started. F. A. Yauger is manager. The exploration tunnel being driven into the north slope of Mount Baldy by the French Creek Gold Mines Co. is in over 1,800 ft.——The Sallie Barber mine, on the crest of Nigger hill, has become a shipper of zinc ore.——On Gibson hill, the Bullion King is producing zinc ore, under leasing operations by Foote & Hight.——Portions of the old Oro property are being worked by John McGarvie and A. E. Keables. The old mill tailings from this mine were found to contain sufficient zinc to warrant concentration.——On Mount Baldy the Morning Star has been worked by Condon & Shrock, who have made connection between the tunnel and the main shaft. They made frequent shipments during the year.——The Carbonate and the Little Tommy group have been purchased by the Buckeye M. & M. Co. A five-stamp and concentrating mill was put in at the tunnel-mouth of the Laurium.——The Silver King, on Nigger hill, has been developed by Widmar & Dean, lessees.——The Novelty, on Nigger hill, owned and operated by Detwiler & Keables, will soon have its ore tapped by a new shaft.——The Dunkin mine, on Nigger hill, after two years' idleness, has been leased to Baird Bros., of Leadville.——In Swan valley, the Carrie property, with its stamp-mill and cyanide plant, on the north slope of Wise mountain, was recently sold to S. F. Stoughton, of Stoughton, Wis.——In Summit gulch, the Acton-Lyman property has disclosed a vein of high-grade ore.——The Jessie, in Gold Run, has had a long run, under lessee management.

Teller County.

The United States Reduction & Refining Co. intends building a mill for the treatment of tailings at Colorado City. The plant will have a capacity sufficient to treat the tailings of the ore now treated by the company's two mills at Colorado City.——McLain and associates, leasing on the Mary Cachen at Victor, has made a new strike at a depth of 500 feet.

IDAHO.

Boise County.

A new electric power plant and dam are being built at Garden Valley, on the south fork of the Payette river, to supply electric power to the dredgers of Boise basin. This is expected to be in running order in time for the placer season of 1906. There are four large dredgers in the Boise basin, two of them of modern design and construction. Two more will be built next season.

Idaho County.

It is reported that the Thunder Mountain Gold Co.

will add five stamps to their mill near Oro Grande. W. Stoever is manager and S. W. Swing assistant.——A trail is being built from the Oro Grande to the Umatilla mine, of which W. C. Brower is superintendent. Work is to be continued throughout the winter at the mine.——H. V. S. Richards, manager of the Fairbanks Mining & Milling Co. near Grangeville, will continue work all winter.——A cyanide plant is to be put in to treat the ore from the Sunnyside mine near Roosevelt.——The Dewey mill at Roosevelt is said to be treating 50 tons per day of $10 rock. The company has 35 men at work.——A 100-ton mill is on the road for the Curran-Caswell Gold Mining Co., working the Mysterious Slide group, adjoining the Dewey. The lower tunnel is in 270 feet.——The flume and 10-stamp mill has been completed at the Thunderbolt mine of the Trapper's Flat Mine and Milling Co., three miles from Knox, on the Thunder Mountain wagon road.

Kootenai County.

The Marguerite G. M. & M. Co. intends to put a concentrator on the north side of Lake Pend d'Oreille, near Hope. J. Johnson is superintendent. Ore is to be shipped to the smelter at Sandpoint when it is completed.

Shoshone County.

The detailed statement of the operating expenses of the Bunker Hill & Sullivan Mining & Concentrating Co. at Wardner for the half year of June-November, 1905, shows that there were 177,240 tons of ore produced, of which 152,655 tons were concentrated. Stoping 24,540 tons of shipping ore cost an average of $1.568 per ton, of which $1.224 was paid for labor, $0.075 for explosives, $0.024 for illuminants, $0.002 for lubricants, $0.009 for iron and steel, $0.002 for miscellaneous supplies, and $0.180 for timber and lagging. The labor cost for stoping 152,658 tons of concentrating ore was $0.89, explosives $0.061, and a total of $1.164. Concentrating costs averaged $0.194 per ton, of which $0.123 was paid for labor and $0.071 for supplies. Tramming cost $0.055, of which $0.044 was paid for labor. Exploration, shipping, superintendent and office costs make a total of $1.652 per ton. The ore produced contained 467,047.93 lb. lead and 907,550.11 lb. silver, all valued at $2,457,345.40. Additional costs charged to exploration, shipping, assaying, surveying, litigation and improvements gave a total of $383,260.91 for Wardner expenditures.——Work is to be resumed on the Surprise group on the east fork of Pine creek, and owned by Kellogg people. The lowest tunnel cut the ledge when in 425 feet. The ore has been tested in the Bunker Hill & Sullivan mill and the results show that it is possible to produce 70% lead concentrates running 20 oz. silver to the ton and 50% zinc concentrates.——The Frisco mine at Gem is to be unwatered by Manager Ehrenburg preliminary to starting up.

MONTANA.

Granite County.

It is reported that the Nancy Hanks mine, near Garnet, is regularly shipping gold ore.

Jefferson County.

The Australia mine, five miles north of Boulder, is to be worked by J. Mulligan.——Wise & Eiper are reopening the Emmett mine, north of Boulder.——A dredger is being put in to work the Winter's placer, near Basin. Wm. Brazenall is agent at Basin.

Lewis and Clark County.

After an idleness of nearly 20 years, work has been started at the Whitlach-Union mine, near Unionville, south of Helena, under the management of the Whitlach Mining Co., in which A. W. Martin, H. N. Canoll and F. S. Sizer are interested. A new 20-stamp mill has been installed; an aerial gravity tramway 2,100 ft. long has been built to convey the ore from the mine to the mill; general and assay offices have been fitted up and bunk-houses for the men; a shaft 500 ft. in depth has been sunk; a plentiful supply of water can be secured from the mine for all purposes. A large air compressor has been put in and 10 machine drills. The compressor will be run by electricity and the mill also, the power being brought from the Canyon Ferry dam.

Silver Bow County.

(Special Correspondence).—The Raven Mining Co. will begin shipping ore from the Snoozer mine, upon which it has been doing development work since last June. Three copper veins have been opened in the ground, one of them for 2,000 ft. on the 1,200 and 800-ft. levels. The company has begun crosscutting from the shaft at the 1,500 level to get the veins.——The East Butte Mining Co. has taken over all the properties it has under option. They include the Lassen, Yankee Boy, Oneida, Mary MacLane, Dutton, Jackson, McDonald, Hoy, Hancock and Wheeler, all of which have been producing in a small way under operations by leasers who shipped only the first-class ore. About 150 tons of ore have been shipped daily, averaging 12% in copper, with gold and silver. The new company will soon increase the output to 500 tons a day. The company has purchased a site for a concentrator. It is possible that an offer of the Anaconda company to handle all the ore at the Washoe smelter will be accepted.——With the announcement that the Pittsburg & Montana Co. has been sold to the Mellen interests in Pittsburg for $30,000,000, it is predicted that the experiments that have been carried on with new smelting methods by Ralph Baggeley will be abandoned.

Butte, Jan. 2.

NEVADA.

Esmeralda County.

Whether Tonopah, which is the seat of Nye county, is in Nye or Esmeralda county, is a question that the courts of the State will have to decide. Since the discovery of the camp several surveys have been made, and it has developed that at least three of them place the greater part of Tonopah, along with the Nye county courthouse, in Esmeralda county. These surveys say the county line passes through Tonopah at the Sibert shaft. The land office holds this to be true as it requires persons applying for patents to lands to define those west of the Siebert shaft as being in Esmeralda. The entire dispute grows out of the location of the 38th parallel north. The State, in defining the boundaries of the various counties, provided that the west line of Nye should run northerly to the 38th parallel, and then strike westward at an angle of 45° to a given point. A number of capable engineers say the accepted location of the 38th parallel is erroneous; that it is several thousand feet farther north than reputed, which places the camp in Esmeralda county. The people of Esmeralda county have no intention of forcing Tonopah within their county, and if the courts pass upon the matter adversely to Nye county, the Legislature will be asked to move the line in such a manner as to leave Tonopah within Nye, where they think it belongs.

Work on the Big Injun mine, near Sodaville, is to be commenced under management of C. L. Barnes.

Ormsby County.

The Selby claims, six miles north of Carson, have been sold to Philadelphia people. A mill will be built and the mines worked on a large scale.

Storey County.

Satisfactory arrangements have been made with the Butters reduction plant near Virginia City to treat 100 tons of ore daily from the Tonopah Mining Company's property at Tonopah. As soon as the machinery can be received, the capacity of the plant will be doubled. The ore will be crushed at the Best & Belcher mill and the pulp flumed to the plant, which is in Six Mile Canyon. Reduction will begin in January. Heretofore all the ores of Goldfield and Tonopah have been shipped to the smelters in Utah, Colorado and California.

White Pine County.

The Jupiter and Big Dipper claims, near Ely, have been taken over by the Cumberland-Ely Copper Company.

OREGON.

Baker County.

Ore has been cut in the lower tunnel at the Morning mine near Greenhorn. The mill is running steadily. The tunnel cuts the ledge at a depth of nearly 300 ft.——At the Pyx mine they have drifted 100 ft. on the ledge from the bottom of a 60-ft. shaft and they have 4 ft. of ore.——Superintendent Brady of the Belcher mine, near Greenhorn, has resumed work with 15 men. The mine has been shut down since last spring.

At the Imperial mine at Cable Cove, Superintendent Arthur is blocking out ore for the new 75-ton concentrator. The Miner drift is in 1,200 ft. and a crosscut has been started west for the Imperial vein. The Eagle drift is in over 650 feet.

SOUTH DAKOTA.

Lawrence County.

The year of 1905 has been a prosperous one for the Black Hills. The output of gold will amount to about $8,000,000, which is a slight increase over that of last year. There were some unfortunate mishaps during the season, which took off some of the expected increase, such as the fire of the Horseshoe Co., which destroyed the 300-ton cyanide mill, and the failure of the Golden Reward Co. to start up the smelter in Deadwood.——The Homestake Co. averaged a daily production of 4,000 tons, and the gross output may reach $5,000,000. The company is employing 2,500 men.——The Oro Hondo Co. put a shaft down to the depth of 1,200 feet. Some high-grade ore has been found, but it is believed that the shaft was not sunk deep enough to find the Homestake vein.——Southeast of the Ellison hoisting works the Homestake South Extension Co. has put a shaft down 100 ft.——The Wauconda and Anaconda companies, also the Big Lead Co., have done some work.——The Wasp No. 2 Co. has been a steady producer.——The Safe Investment is excavating for a 40-stamp mill.——The Lucky Strike mine has opened up during the year a wide vein. Plans have been drawn for a mill.——In the Bald Mountain district the producers have been the Golden Reward, Horseshoe, Imperial, Dakota, Portland, Clinton and Dividend mines. The Golden Reward Co. is managed by Henry Schnitzel of Lead.——The largest amount of ore in reserve outside the Homestake mine is said to be in the Horseshoe mine.——The Imperial Co. has unwatered the Bertha mine and is taking out 30 tons a day to the Deadwood mill.——Adjoining the Imperial mine are the holdings of the Portland and Clinton Companies. These companies have been shipping from 50 to 70 tons of ore daily to the Lundburg-Dorr mill at Terry.——West of the Homestake belt is the Phonolite district.——The Globe Co. has a shaft 500 ft. deep and 3,000 ft. of underground workings. The company has a mill building completed for a 100-ton cyanide plant, and machinery is soon to be put in. The other companies are planning to do more work this coming year.——At the Union Hill ground, in the Galena district, the Branch Mint Co. has built a railway four miles long, connecting the mine with the mill, has rebuilt the Union hoist, and is building a large cyanide plant, which will be in commission the middle of February. Near the Branch Mint is the Gold Edge-Maid mine, which has been producing for most of the year.

Pennington County.

The Gopher Mining Co. has a free-milling proposition four miles north of Hill City upon which a 10-stamp mill has been built. Work has been in progress also on the Dolcode, J. P. and Fraternity mines. John Truax has interested capital in a wolfram proposition near Hill City, and a hoist and camp buildings are complete.——E. C. Johnson has unwatered the Gertie shaft to the 500-ft. level and a small testing mill is treating the tin-bearing ore.——The Keystone-Holy Terror Co., recently reorganized, is to resume work near Keystone.——The Bullion Mining Co. is excavating for a mill adjoining the Keystone mine, and the Lucky Boy Co. has a shaft which has opened up good ore. This company will build a mill this year.——North of Keystone, four miles, the Eagle Rock Mining Co. has purchased the Wealthy mine and mill.

UTAH.

Beaver County.

At Pine Grove, 25 miles south of Frisco, on the south side of the Wah Wah mountains, the Revenue Mining Co., L. G. Burton of Salt Lake president and general manager, has run 3,000 ft. of tunnel and intends to put in a mill in the spring.——The Wasatch King Mining Co. is working copper claims in the Beaver Lake district, 10 miles northwest of Milford. A tunnel has been run 560 ft.——The Southern Copper Co. in the Beaver Lake district intends to continue its shaft from the 100 to the 500-ft. level. Ed. Wills is superintendent.——The Montreal copper claims, five miles northwest of Milford, are being worked under the direction of J. Forgie.——The Estrella Mining Co. is sinking a 400-ft. shaft on its claims six miles southwest of Milford. S. A. Turbet is superintendent.

Juab County.

The ore shipments from the mines of Tintic for 1905 were the heaviest in the history of the district, amounting to 6,429 carloads. The Centennial-Eureka mine, at Eureka, is the heaviest shipper, with a total of 3,012 carloads. The shipments from the Gemini mine have showed a marked increase, and this mine comes second with an output of 621 carloads. The Eagle & Blue Bell, one of the new mines in the Eureka end of the district, has sent out 415 carloads. The total shipments for the year were:

	Cars.
Ajax	128
Carisa	133
Grand Central	274
Mammoth	419
Gemini (Keystone)	621
Centennial Eureka	3,012
Eagle & Blue Bell	415
Godiva	28
Uncle Sam	136
Yankee	183
Victoria	134
Victor Consolidated	28
Bullion-Beck	262
May Day	88
Tetro	8
Star Consolidated	20
Joe Bowers	1
Eureka Hill leasers	121
Black Jack	11
Dragon Iron mine	66
Bullion-Beck tunnel	10
Lower Mammoth	13
Hopes	1
South Swansea	34
Eureka Hill	4
Argenta	2
Monterey	3
Marlow & Baxter	1
Swansea	168
J. Osborne	1
V. H. Bates lease	1
La Clede	4
Brooklyn Consolidated	11
Kennear & Parker	3
Paxman lease	1
Ridge & Valley	16
Total	6,429

CONCENTRATES.

May Day jigs	6
Uncle Sam mill	43
Total	49

As the railroad cars now in use at the mines average 50 tons each, the output from the mines for the year would amount to 320,900 tons.

Salt Lake County.

The equipment of the United States Mining Co. consists of six copper blast furnaces, and one reverberatory furnace, three lead furnaces, and three more for the same purpose now under construction.

Summit County.

During 1905 Summit county mines produced 84,800 tons of ore and paid dividends of $33,747,000. The following summary of the year's work in the mines of Park City is condensed from the Salt Lake *Tribune:*

Under the superintendency of J. A. McCaskell, the Daly-West has passed through a prosperous year. Nearly 500 men have been employed in the mine and mill. Orebodies are blocked out below the 1,500-ft. level. Sinking the shaft had to be discontinued for the time on account of the closing up of the Ontario drain tunnel. By an agreement with the Ontario company the tunnel will be run under the Daly-West workings and will drain the mine at a depth of about 2,100 ft. The Daly-West shaft will be sunk to this depth. The mill, in charge of F. W. Sherman, has been handling from 10,000 to 15,000 tons of second-class ore per month, and has been running steadily throughout the year. It is operated almost entirely by electric power furnished from the Ontario company's plant. The recently constructed slime plant, operated in connection with the mill, is equipped with Wilfley tables and slimers.——The Silver King is essentially a deep mine, but little ore having been discovered above the 700-ft. level. From this level to the 1,100 has been taken out nearly $25,000,000 worth of ore. From the 1,000 to the 1,300, the bottom level of the shaft, ore has been opened up. The 1,200-ft. level has shipped ore carrying 60% lead, 250 oz. silver and nearly an ounce of gold, with some copper. The mine is under the charge of M. J. Dailey as superintendent and Frank Dailey as foreman. The mill, a 400-ton concentrator, is under the supervision of J. W. Stevens, with J. W. Thompson, Jr., as assistant, and handles the second-class ore from the mine. After nearly two years suspension the management of the Daly-Judge has given orders for the property to commence operations again. John A. Daly is manager. Most of the development work has been done on the 1,200 and 1,500-ft. levels beyond the old workings of the Anchor company. Stoping has been started on the 1,400-ft. level and the ore bins at the mill are full of concentrating ore. The mill is in charge of James T. Kescel and is now being overhauled. Five new Hartz jigs have been added and changes have been made in the arrangement. Contracts have been made for the output of the mine and mill and it is found under the new conditions that the zinc middlings which before were a total loss can now be made to yield a profit.——The Kearns-Keith has been active during the year, employing 75 men in the mine and mill. Its claims are a consolidation of the Crescent, Apex and Ross group, which lay to the

west and adjoin the Silver King. Beneath the track on the Hanauer tunnel level a large body of first-class shipping ore has been blocked out and this ore will be stoped. Prospecting has been carried on in the Apex country. Enough second-class ore has been taken out to keep the mill running. The company may eventually build a large concentrating plant near the mouth of the Alliance tunnel.——Just as the new Ontario mill was ready a fire destroyed the hoist and made an entire close-down necessary. When this was rebuilt the drain tunnel caved, and the mine has been practically idle since April. The mine soon filled with water, so that it is impossible to determine the condition of the underground workings. The shaft is over 2,000 ft. deep, nearly 500 ft. below the tunnel level.——A new surface plant has been built at the American Flag, and much underground development work has been done. The shaft is down 1,100 ft. A new 14x20 double-geared hoist, with 1,200 ft. of cable on each reel, a large compressor, two 60-h. p. boilers and a steel gallows frame were put in place this year.——The Little Bell and West Quincy are operating through the Little Bell shaft. The West Quincy is running a drift from the Little Bell shaft to their own to drain the water.——The Silver King Consolidated is between the Silver King and the old Crescent. It has one of the most complete prospecting plants in the camp. The shaft is down over 800 ft., and drifting is being done on a ledge.——The Comstock has worked throughout the year, and while no ore has been taken out in shipping quantities, the showing is encouraging and the management will continue work. ——The California has done little aside from assessment work.——The Ferry-Hancock, along the line of the Ontario tunnel, has been working all year. New boilers and compressors were installed and a shaft sunk in the tunnel. The mine is in charge of George R. Hancock.——The New York winze has been sunk 200 ft. from the 600-ft. level in ore.——The Naildriver has been practically closed down for the past year, and it is not expected to open before spring.

WASHINGTON.

Okanogan County.

(Special Correspondence).—The Everett Galena Mining Co. has sunk a shaft 90 ft. on the vein. A tunnel is in 370 ft. and tapped the vein 295 ft. deep, going through a foot of talc on the hanging wall and thence 15 ft. into clay and quartz boulders.——The Salmon River Mining & Milling Co. is to resume work soon. A tunnel is in 800 ft.——The third vein of the Triune has been cut in the main tunnel. The ore is free-milling gold.——At the Grand View ore is being stoped on the No. 3 tunnel level, and ore in the bin is awaiting the completion of the aerial tramway. ——A vein of bituminous coal has been discovered, six miles north of Molson. It is of good quality for forging and welding.——At the Rich Bar group a construction cut for the Victoria, Vancouver & Eastern Railway has developed a vein of silver-lead ore, 8 ft. in width to a depth of 25 ft.——The Similkameen Falls Mining Co. will be reorganized under the laws of Washington, to take over claims near the Similkameen falls. The new title will be the Gold Sand Mining Company.

Loomis, Jan. 2.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District.

Boundary shipments for the week ending Dec. 30 were: Granby mines to Granby smelter, 16,818 tons; Mother Lode to British Columbia Copper Co.'s smelter, 2,522 tons; Brooklyn to Dominion Copper Co.'s smelter, 1,271 tons; Sunset to Dominion Copper Co.'s smelter, 427 tons; Emma to Nelson smelter, 198 tons; Oro Denoro to Granby smelter, 33 tons; Skylark to Nelson and Granby smelters, 50 tons. Total for week, 21,319 tons; total for year to date, 928,352 tons. Boundary smelters treated as follows: Granby smelter, 14,915 tons; British Columbia Copper Co.'s smelter, 2,628 tons; Dominion Copper Co.'s smelter, 2,114 tons. Total for week, 19,657 tons; total for year to date, 941,817 tons.

A review of the mining and smelting industry for 1905 in the Boundary district shows that it has been a period of steady progress in both the high and low-grade sections. The dividend declared by the directors of the Granby Consolidated on December 1, the amount to be paid on January 15 to shareholders being $405,000, was the largest dividend ever paid by a British Columbia mining company at one time. Another event was the resumption of mining and smelting operations by the Dominion Copper Co., owning claims in Phœnix Camp and a two-furnace smelting works at Boundary Falls. This followed the absorption of the assets of the Montreal & Boston Consolidated, which formerly worked the same mines and smelter. Another event is the announcement of the letting of contracts by the directors of the British Columbia Copper Co. for three new furnaces at their smelter, each of which will be larger than any now in commission in the Boundary. The year 1905 opened with three smelters in full blast in the Boundary and it closed likewise. In the meantime, however, the Boundary Falls plant has been idle for six months, while the company owning it was being reorganized. The British Columbia copper smelter and the company's Mother Lode mine, in Deadwood camp, have been operated continuously during the year, giving employment to 200 men.——At the Granby mines the new No. 3 terminal ore bins and ore crusher were placed in commission, by which the Great Northern Railway receives a part of the tonnage on this property. During the summer orders were placed for a third ore-crusher and for a 250-h. p. electric hoist, to be used at the head-works of the new main shaft that will be sunk on the property. In November the No. 1 ore-crusher building burned down, thus throwing the great bulk of tonnage to the other crusher and over the Great Northern.——The Mother Lode mine has been worked continuously, and a start was recently made to deepen the main shaft of the property from 325 to 500 ft., the diamond drill having proved the existence of ore in the lower levels.——The Dominion Copper Co. is operating the Brooklyn, the Stemwinder, the Rawhide and the Sunset mines, and shipping regularly from all of them. This company intends to erect a modern smelting plant, and in the meantime will use the old plant at Boundary Falls.——In Summit camp, the Emma and the Oro Denoro have been operated most of the year. The former is worked by the British Columbia Copper Co., the ore going to the Nelson and Greenwood smelters. ——The Providence, Skylark, Crescent, Last Chance, Preston, Helen, Elkhorn, Prince Henry, Don Pedro and E. P. U. are high-grade mines that have been worked this year, some of which have shipped ore. The need of a concentrating plant in the district is felt. Still other high-grade mines that have been operated this year are Gold Finch, Gold Bug, Dynamo, Republic, None Such, Bay, Mavis, Silver Cloud, Silver King, Barbara, Maori, Jewel, Twin and Mountain King, and Fremont. Up the West Fork, the Sally and Rambler have been worked and have shipped, with good results, but being as yet 50 or more miles from transportation, shipping is expensive. This, however, is being remedied by the building of the Midway & Vernon Railway, which will afford transportation facilities in another year. At Franklin Camp, 45 miles north of Grand Forks, at the headwaters of the north fork of Kettle river, a number of claims have been located and the McKinley, which was recently bonded to C. R. Hamilton of Rossland for $200,000, has probably had the most work done on it. Other properties in this camp are the I. X. L., the Banner, Homestake, Alpha, Mountain Lion, Gloster, G. H., Tiger, Mineral Hill, Pollard, Ajax, Jumbo, Manhattan and Gold King.

Nelson District.

The Reliance mine, on which a mill on the Hendryx principle has been put in, has been running with an output of 50 tons daily.

Rossland District.

A. J. McMillan is again managing director of Le Roi Mining Co. of Rossland. Cable advices from London announce the resignation of the old board of directors, which had expelled Mr. McMillan from his position, but was repudiated at the recent meeting of Le Roi stockholders in London. Mr. McMillan made his fight on the ground that the company should continue the operation of its smelter at Northport, and should not make an amalgamation with the War Eagle, the Centre Star and the St. Eugene mines, and the Trail smelter. This consolidation was supported by his fellow directors, and when he refused to join with them in the scheme they removed him from the board. Since then John A. Mackenzie has been conducting the affairs of the mine. Under his orders the Northport smelter has been closed. It is expected that Mr. McMillan will immediately start it again, and will send the ore there instead of to Trail under a three-year contract made with that smelter by the anti-McMillan management.

Slocan District.

The total ore shipped by the various mines of the Slocan and East Kootenay districts for the week ending December 30 was 1,471 tons, of which 769 tons were treated at the Hall Mines smelter, 300 by the Marysville and the remainder at Trail. The shippers were the St. Eugene, 624 tons; Sullivan, 300; Ferguson mines, 50; Hunter V., 50; Second Relief, 47; Payne, 43; Eureka, 40; Lone Bachelor, 39; Black Prince, 30; Reco, 30; American Boy, 30; other mines 198. The estimated output for the year in lead is about 29,000 tons. The Trail smelter treated 3,457 tons of ore, the bulk coming from Rossland. The total output of Kootenay and Yale districts for the year is estimated at 1,314,500 tons of all ores.

Vancouver Island.

The Mt. Sicker & Brenton Mines Ltd. is sinking a double-compartment shaft 4 by 8 ft. to a depth of 200 ft., being down 150 ft. on the Copper Canyon claim, near Mt. Sicker. A. Young is superintendent.

MEXICO.

Chihuahua.

Final arrangements have been completed by which F. P. Sherwood takes over the Guadalupe mines, owned by N. S. Benton and associates, near Inde. F. L. Bosqui of San Francisco is visiting the property to determine the best method of treating the ore.

Jalisco.

The Virgin de Guadalupe placer, between Tapalpa and San Gabriel, has been sold to S. Camberos and J. Martinez, both of Jalisco. Kinross & Brown propose to sink 600 shafts to bedrock to determine the amount of pay dirt and the average value. The deposit is 10,000 m. long and 400 m. wide, and comprises 400 pertenencias.

The Independence Mininig & Smelting Co., C. D. O'Brien, Jr., superintendent, has made a six-day trial run with its concentrating plant on copper ores in the Guachinango district. The plant, which is in charge of J. O'Worden of Guadalajara, is to be started up for steady work early in the coming year. Superintendent O'Brien is placing orders for additional machinery.

KOREA.

In the report to the shareholders of the Oriental Consolidated Mining Co. at Puk Chin, it is stated that the operating costs, including all expenditures except those for new construction or development of mines not producing ore, were $2.16½ per ton. They have been aided in arriving at this low figure by the cheap ore obtained from the dumps, and by having expended less than a normal sum upon development work. The latest reports from Korea show a continued lack of labor. This difficulty, combined with the effects of the heavy floods, has prevented the mines and mills from being operated to the normal capacity during the last three months. The company has a large quantity of low-grade ore to be treated. The apparatus for testing the company's placer dredging ground has reached Korea, and while probably the tests are now being made, no report of the results has yet been received. The electric power installation is now in use. The reservoir supply of water, intended to supplement the river supply during the freezing weather, will not be available until next year, owing to the damage done to the dam by the severe flood that washed over it before completed. The report of General Manager H. F. Meserve, covering the operations at the Wunsan district for the year ending June 30, 1905, states 254,821 tons of ore were mined at a cost of $243,807.17, or $0.955 per ton, including cost of all underground development work in these mines during the year. This ore was produced from the Chittabalbie, Tabowie, Taracol, Kuk San Dong and Charabowie mines. During the year there were crushed at the five mills 257,647 tons of ore worth $1,274,106.28. The milling expenses were $244,904.885, or $0.57 per ton. Cordwood made up $0.23 per ton of the $0.57 per ton milling expenses. The milling expenses at the Chittabalbie mill were unusually high, due to considerable necessary repair work. The following table gives information as regards milling operations for the year:

Milling operations for the fiscal year. All figures given in U. S. Gold:

Name of Mill	Number of Stmps.	Tons Ore Crushed	Duty for Stamp 24 hrs.	Value Ore per ton	Value Tailing per ton	Cost of Milling per ton
Chittabalbie...	20	20,314	3.4	$3.845	$0.955	$0.94
Tabowie.....	40	51,389	4.0	5.31	0.71	0.58
Kuk San Dong..	20	25,742	3.8	4.90	0.635	0.57
Malbong	40	58 464	4.2	3.25	0.60	0.46
Taracol.	80	98,708	4.1	5 08	0.93	0 55
	200	257,647	4.0	$4.945	$0.78	$0.57

The combined operations of the Tabowie and Taracol cyanide plants during the year were as follows:

Character of Concentrates	Tons Treated	Value	Percentage Extraction
Tabowie and Taracol mills yield for year....	21,936	$354,708.88	83.2
Tabowie mill, June, 1904.....	130	2,617.22	75.0
Tabowie cyanide dump re-treated.....	4,989	66,371.63	54 3
Taracol cyanide dump re-treated.....	5,501	28,950.77	33.6
	32,556	$452,648.50	75.8

The detailed statement of the average operating expenses of all the mines shows that mining supplies (listed) cost $0.4495 per ton, labor $0.3775 per ton, salaries and board $0.0133, and miscellaneous costs made a total of $0.9568 for mining. Milling costs, including cyanide, were $0.3637 per ton, labor $0.0668, salaries and board $0.1012, other expenses giving a total of $0.5695. The total cost for mining and milling, including amalgamating, concentrating and cyaniding was $1.5263.

Commercial Paragraphs.

THE Midvale Steel Co. of Philadelphia have removed their San Francisco office to 630 Rialto Building.

THE Occidental Machinery & Engineering Co., Inc., of San Francisco has established headquarters and general offices at 401 Mission street corner of Fremont. This company, with Bruce Cornwall president and A. E. Roe vice-president and general manager, was recently organized for the purpose of handling mining and sawmill machinery of every description. Branch offices at Los Angeles, Cal.; Portland, Or.; Seattle and Bellingham, Washington.

AMONG the contracts that F. L. Smidth & Co., cement engineers and makers of cement machinery, 41 Cortlandt street, New York, have recently taken is one for 17 of their large size tube-mills for the Pacific Portland Cement Co., Cement, California, and another one for 24 kominuters and tube-mills for the new plant at Fogelsville, Lehigh Co., Pa., of the Lehigh Portland Cement Co. Three additional kominuters are being installed at the Mill 'D' of the Lehigh Company.

ON the page opposite the first reading matter in this issue appears the advertisement of Fair-Williams Bridge & Mfg. Co., of Ottumwa, Ia. This company has been in the bridge business under a different management for a good many years, but has lately been acquired by the managers of the Ottumwa Box Car Loader Co., and the two plants are now consolidated, all the manufacturing business being done under one roof of a very thoroughly equipped and arranged manufacturing plant. They manufacture box car loaders for loading any material in box cars where a large tonnage is needed to be handled, also mine car wheels, mine cars complete, cages, sheaves, steel bridges, coal mine tipples, steel head frames, and anything in the line of structural iron work for mining purposes, and the erection of buildings.

Trade Treatises.

Circular No. 1,107 from Westinghouse Electric & Manufacturing Co. of Pittsburg, Pa., describes Westinghouse automatic circuit breakers with carbon break for direct and alternating currents. Folder No. 4,051 pictures and describes pipe-thawing apparatus.

'Machinery and Equipment for the Smelting of Ores, Catalogue 105 of the Fulton Iron Works, 15-17 First street, San Francisco, Cal., presents engravings and explanations of furnaces, converters and accessories for copper and lead smelting. The pictures are good and the notes on smelting will be of interest to anyone engaged in smelting. The neat appearance of the catalogue gives a favorable impression of the company's product.

Dividends.

January 2 the Bunker Hill & Sullivan Mining & Concentrating Co. declared dividend No. 100 of $180,000, payable on the 4th inst. This makes the total paid since Jan. 1, 1905, $3,435,000, and total to date $5,706,000.

Personal.

H. HIBBERT is in Siberia.

CHAS. A. MOLSON is in New York.

GEORGE A. SCHROTER is at Pachuca, Mexico.

T. MERWYN-SMITH is examining mines in Ashanti.

W. H. BASHAM of Placerville is visiting San Francisco.

M. M. O'SHAUGHNESSY is visiting San Francisco from Hawaii.

H. H. NICHOLSON is examining mines at Guanajuato, Mexico.

E. A. MONTGOMERY of Bullfrog, Nevada, is at the St. Francis.

H. C. HOOVER has returned to London from Western Australia.

H. E. ARROWSMITH is with the Tennessee Copper Company.

W. E. DEFTY will be engaged in Sonora, Mexico, during January.

CHARLES JANIN has returned from western Chihuahua, Mexico.

F. H. MINARD is examining mines at Gabriel, in Durango, Mexico.

D. F. CAMPBELL has joined the staff of the Mountain Copper Company.

GEORGE J. HOFFMANN has left London on his return to Johannesburg.

A. H. BROMLY is in San Francisco, on his way from Alaska to London.

ROSS E. BROWNE is in London and will remain there for several months.

A. B. WALLACE, lately at Menzies, Western Australia, is in San Francisco.

WILLIAM A. AKERS has changed his residence from El Paso to Los Angeles.

GEORGE KISLINGBURY is examining copper mines in Kern county, California.

LOUIS NOBLE has been appointed geologist for the Great Northern Railroad.

LOUIS WEBB, lately of South Africa, has settled at Cambridge, Massachusetts.

P. B. MCCOY of New York has gone to Central America on mining business.

HENRY F. LEFEVRE was married to Miss Alice Rooks at New York on December 14.

JAS. W. MALCOLMSON is examining the San Gregorio mine at Guanajuato, Mexico.

BEN S. REVETT sailed from New York on his way to Cali, in Colombia, on December 17.

MARK R. LAMB is mill superintendent for Combination Mines Co. at Goldfield, Nevada.

FORBES RICKARD has returned to Denver from examining mines at Silverton, Colorado.

ERNEST A. WEINBERG returned from San Francisco to Sydney by the *Ventura* on January 4.

W. E. THORNE, manager the Snow Storm Hydraulic Co., Alma, Colorado, is in San Francisco.

GEORGE H. EVANS has changed his residence from Breckenridge, Colorado, to San Francisco.

GEORGE R. STEVENS sailed on December 30 from San Francisco to proceed to Wei-hai-wei, China.

C. A. HEBERLEIN is now with the American Smelting & Refining Co. at Aguascalientes, Mexico.

FRANCIS B. VOYLE has resigned as superintendent of the Oakland mine in Sierra county, California.

A. H. RICHARDS has been made head chemist American Smelting & Refining Co. at Salt Lake City.

C. W. WHITLEY is general manager for the American Smelting & Refining Co. at Salt Lake City.

R. H. ANDERSON has succeeded James Finlay as manager Sullivan mines at Kimberley, British Columbia.

C. W. PURINGTON, who has been examining mining property in Cook Inlet, Alaska, has returned to Denver.

JAMES FINLAY has resigned as manager Sullivan mines at Kimberley, B. C., and will visit Paisley, Scotland.

THEO. F. VAN WAGENEN, of Denver, is engaged in examining mines in northern Mexico, with temporary address at El Paso.

HENRY S. PRICHETT has resigned as president Massachusetts Institute of Technology, to take the presidency of the Carnegie Foundation for pensioning professors.

JOHN J. DALY, general manager of the Daly-Judge mine, Utah, and MALCOLM MCDONALD, superintendent of mines at Tonopah, are at the Palace Hotel; J. J. COLEMAN, of Bisbee, is at the Lick House.

Obituary.

JOSEPH D. NEWMAN, a well-known mining man and superintendent Durand mine, died from typhoid pneumonia, at Aspen, Colo., Dec. 28, aged 48 years.

Latest Market Reports.

SAN FRANCISCO, January 4, 1906.

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. January 4, 1906.)

Amalgamated	104⅜	Nevada Con. Copper	12⅜
Anaconda	236	North Butte	81½
Bingham Copper	35½	Old Dominion	36¼
Daly West	18¼	Tennessee Copper	47
Granby	9¾	Tonopah-Nevada	16½
Greene Consolidated	30¼	Utah Copper	38⅞

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

ANGLO-AMERICAN SHARES.

London, January 4, 1906.

	£	s	d		£	s	d
Camp Bird	1	12	6	Oroville	1	0	0
El Oro	1	8	6	Stratton's Independence	0	6	9
Esperanza	5	7	6	Tomboy	1	6	3
Dolores	2	1	6				

(Cabled by courtesy of William P. Bonbright & Co., New York).

METALS.

SILVER.—Per oz., Troy: London, 30d (standard ounce, 925 fine); New York, bar silver, 64⅜c, refined (1000 fine); San Francisco, 64¼c; Mexican dollars, 50½c, San Francisco; 50c, New York.

COPPER.—(By Wire)—New York: Lake, 18½@19c; Electrolytic, 18⅜@18¾c; Casting, 18⅛@18⅜c per pound. Mill copper plates, $21.00; bars, 21@24c. London: £80 2s 6d spot per ton.

LEAD.—New York, $5.60; St. Louis, $5.90; San Francisco, $5.15, carload lots; 5¼c 1000 to 4000 lbs.; pipe 7½@8⅜c; sheet, 8¾@8¾c; bar 6¾c. London: £17 10s ℔ long ton.

SPELTER.—New York, $6.60; St. Louis, $6.45; London, £29 7s 6d ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $35.95@36.15; San Francisco, ton lots, 38c; 500 lbs., 39c; 200 lbs., 40c; less, 41½c; bar tin, ℔ lb., 40c. London, £163.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35@18.85; gray forge, $14.60; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¼c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 11½c; Hallett's, 12½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5½c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDED DECEMBER 19, 1905.

807,988.—INKING PAD—J. F. Ames, Portland, Or.
807,707.—ELECTRIC SIGNAL—Ammann & Campbell, Spokane, Wash.
807,708.—RECORDING APPLIANCE—Ammann & Campbell, Spokane, Wash.
807,800.—ELECTRIC SIGNAL—Ammann & Campbell, Spokane, Wash.
807,898.—POTATO PLANTER—W. E. Bakeman, Snohomish, Wash.
807,534.—COMBINATION TOOL—J. S. Barnes, San Francisco.
807,994.—PUMP—O. R. Beck, Quilcene, Wash.
807,592.—PORTABLE FENCE—J. Becker, Mount Olivet, Cal.
807,431.—ELECTRIC RAILWAY—W. J. Bell, Los Angeles, Cal.
808,006.—ROTARY BRUSH—C. H. Butler, Oakland, Cal.
808,040.—RAIL JOINT—J. S. Goodwin, Centralia, Wash.
808,044.—CAN EXHAUSTER—M. W. Groom, San Jose, Cal.
807,461.—CAR FENDER—E. C. Haynes, Portland, Or.
807,558.—FILTER—E. C. Jaeger, Santa Paula, Cal.
807,940.—HEADLIGHT—M. Johnson, Drain, Or.
807,471.—STACKER—F. A. Kinne, Westfall, Or.
807,621.—CURTAIN FIXTURE—G. W. Kautz, Santa Monica, Cal.
807,750.—BED PROTECTOR—M. B Le Lande, San Francisco.
807,950.—GAS ENGINE—Longtine & Double, Los Angeles, Cal.
807,835.—OIL ENGINE—D. W. Lyon, Sutter Creek, Cal.
807,840.—HOLDER—Martin, Toledo & Kennard, Fernhill, Wash.
807,841.—VAPOR BURNER—J. A. Mather, San Diego, Cal.
807,483.—FISH SCREEN—F. B. Morse, Walla Walla, Wash.
807,969.—ANIMAL TRAP—S. H. Shelley, San Jose, Cal.
807,642.—SOLAR HEATER—Sides & Klensch, Covina, Cal.
807,643.—NAIL PULLER—G. E. Sly, San Diego, Cal.
807,972.—PASTE PRESS—C. R. Splivalo, San Francisco.
807,978.—GRAIN SEPARATOR—J. S. Walch, Roselawn, Cal.
807,521.—ICE CUTTER—F. Walker, Los Angeles, Cal.
37,737.—DESIGN—F. J. Rosenberg, Los Angeles, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

PIPE PERFORATORS.—No. 808,235. December 26, 1905. Edwin R. Graham, Coalinga, Cal. This invention relates to devices for perforating oil and artesian well casings for the purpose of admitting the percolating liquids into the casing to be removed therefrom subsequently by the pumps. Its object is to provide a simple, practical machine for quickly perforating the casing, and comprises an apparatus by which a series of holes may be rolled in a casing instead of having to punch each hole separately and which separate punching necessitates the intermittent moving and stopping of the machine for each hole. It consists in the combination of a head, a star-wheel having its axle supported in inclined slots in said head, toggle-levers connected with said wheel, a rod operable on said levers to actuate the wheel and means to reciprocate the head, and in other details of construction.

BED-BOTTOMS.—No. 808,369. December 26, 1905. John Hoey, San Francisco, Cal. This invention relates to improvements in flexible elastic fabric for bottoms for beds, couches, and like structures. Its object is to provide a flexible elastic support for the bedding or superstructure of couches, beds, sofas, and the like, in which is provided a longitudinal elasticity of the structure and a transverse bracing of the parts to prevent the sides of the elastic structure from being unduly drawn inward when the weight is upon it and to prevent the independent parts composing the structure from getting out of alinement. It comprises a series of parallel interlocked yokes and spiral springs with which the terminal ends are connected, said yokes having their open ends bent to form supplemental curves, and straight transverse extensions with hooks upon the outer ends by which the parallel series may be united into a continuous flexible structure.

PASTE PRESS.—No. 807,972. December 19, 1905. C. R. Splivalo San Francisco, Cal. This invention relates to improvements in presses used in the preparation of macaroni and like paste products. It consists in the combination with a paste press having a die member, of a normally retracted knife operable across the path of the product issuing from said die member, a movable receiver or holder for the product of said die member, and means operable by said receiver to actuate the knife to sever said product. There are other details of construction combined and arranged to form a useful device which produces a more uniform and superior product than can be obtained under ordinary methods. The press has also a considerably increased capacity, and a great saving of time and labor is effected by the die arrangement and the spreading and cutting mechanism.

ROTARY BRUSH FOR STREET SWEEPER AND THE LIKE.—No. 808,006. December 19, 1905. C. H. Butler, Oakland, Cal. This invention relates to an improved rotary brush for street sweeping machines and the like. It consists in combination with a suitable radially adjusted support, of a bunch of bristles, and a bristle-support comprising a pair of relatively reversed, U-shaped clips, one of said clips having its arms slotted and the other clip having its arms fitted within the slots of the first named clip, said clips having registering perforations and provided with means for forcing the clips together to grip the bristles.

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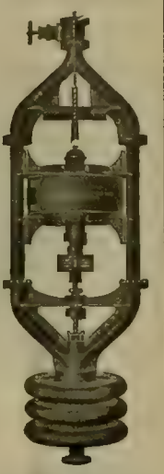

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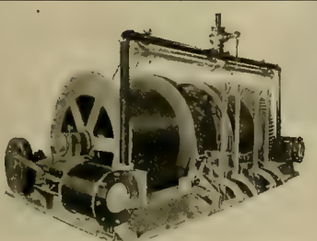

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Any stock upon which this assessment shall remain unpaid on Wednesday, the 31st day of January, 1906, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on WEDNESDAY, the 28th day of February, 1906, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

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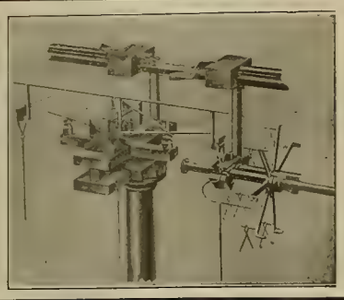

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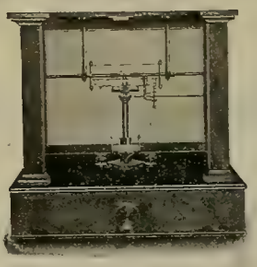

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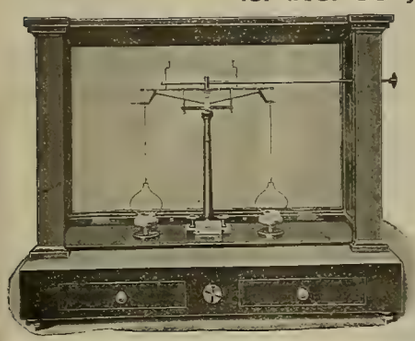

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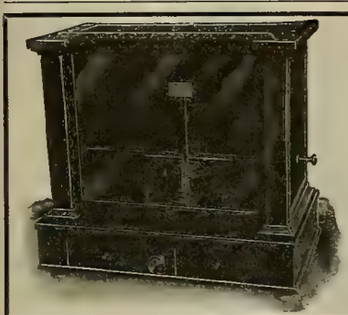

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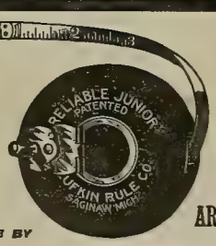

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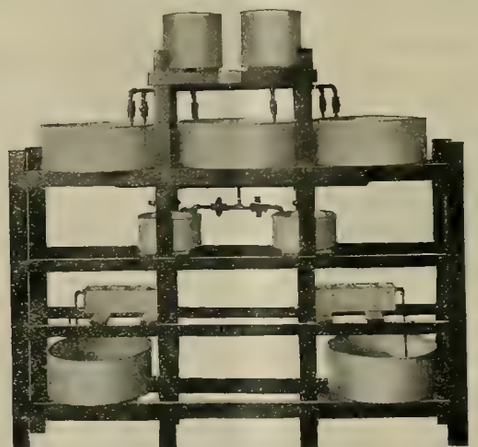

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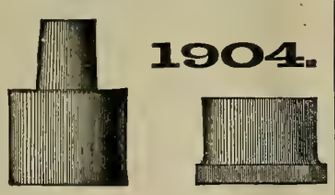

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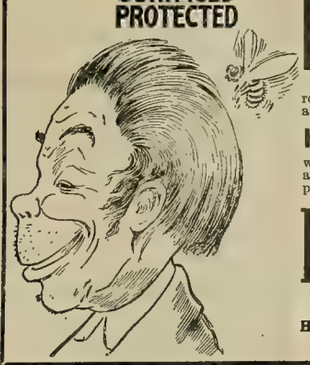

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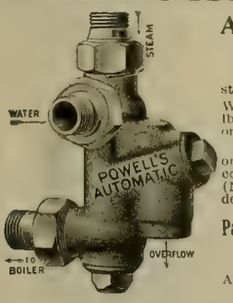

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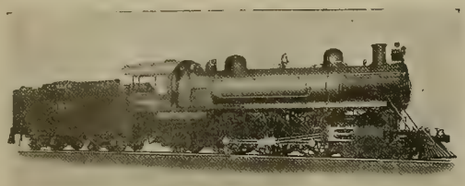

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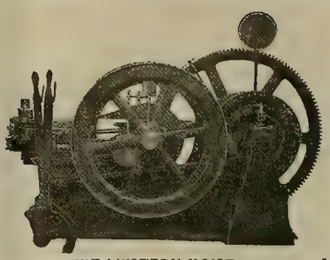

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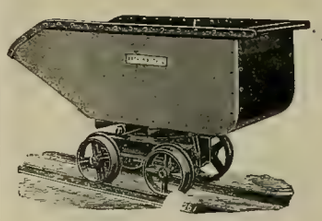

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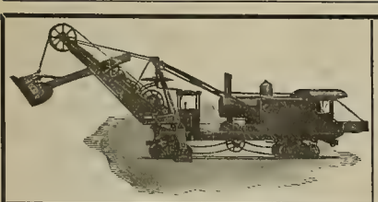

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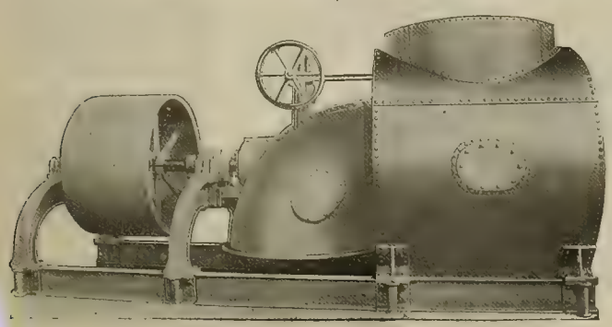

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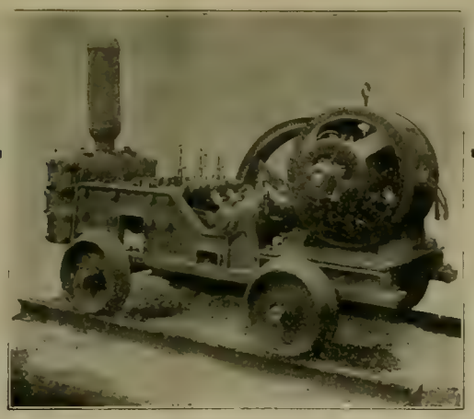

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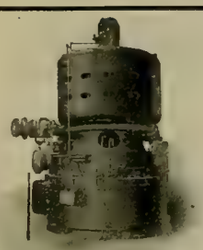

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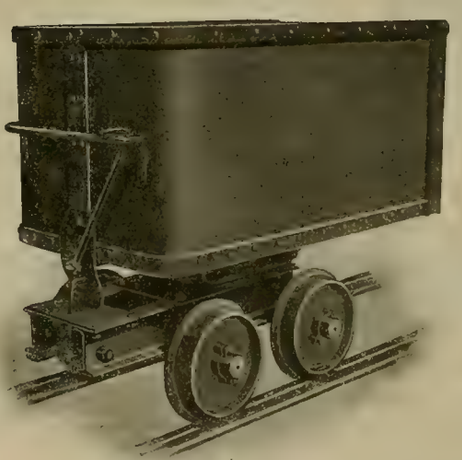

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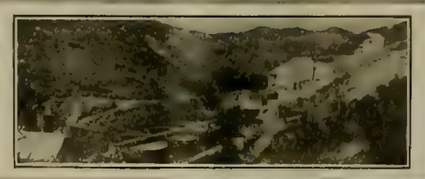

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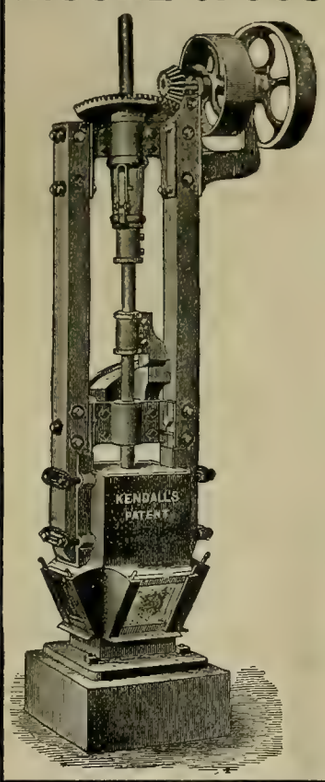

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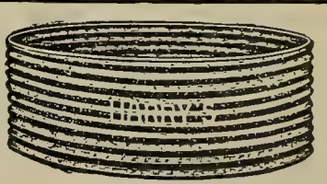

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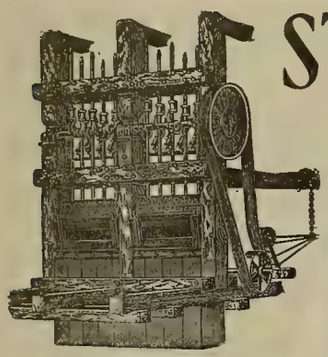

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Double Rope
TRAMWAYS
AND
ROPEWAYS
(Single Rope System)

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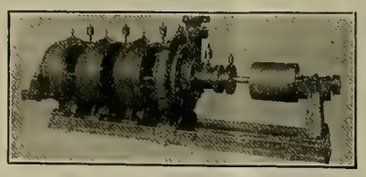
FOR HIGH HEAD PUMPING

SEND US YOUR SPECIFICATIONS



3-Inch 4-Step Pressure Pump raising 225 gallons per minute 320 feet.

EFFICIENCY UNEXCELLED

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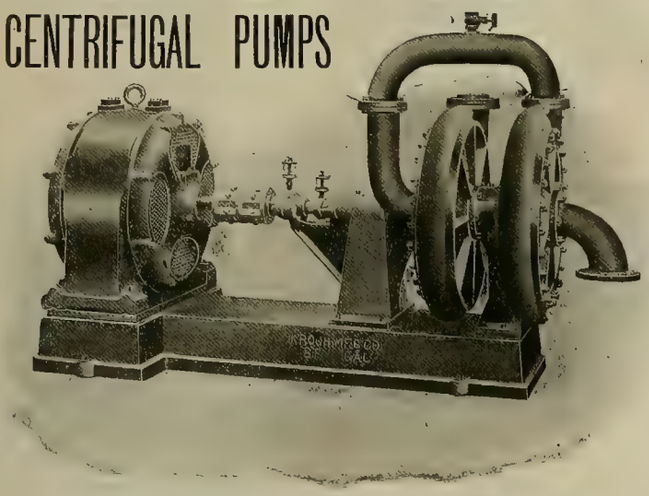

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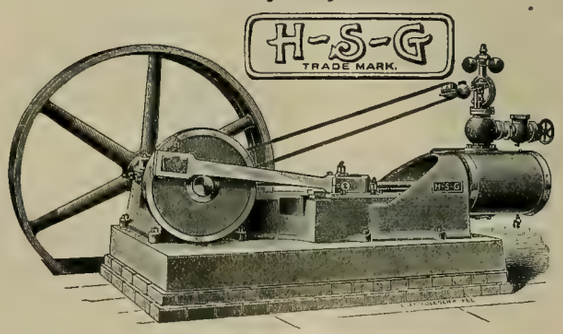

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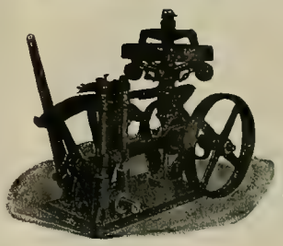

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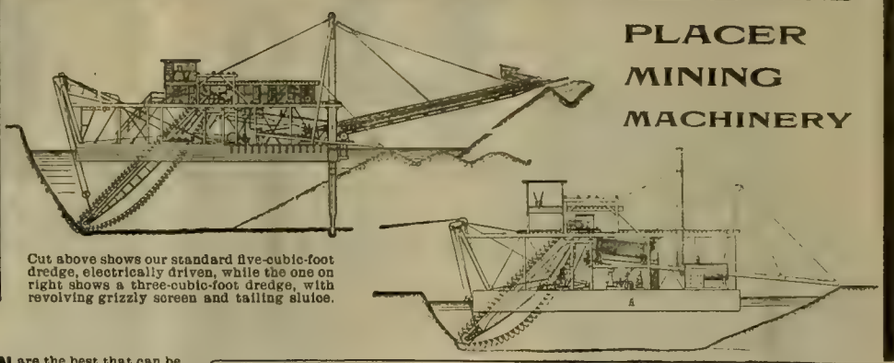

Cut above shows our standard five-cubic-foot dredge, electrically driven, while the one on right shows a three-cubic-foot dredge, with revolving grizzly screen and tailing sluice.

OUR DREDGES IN DESIGN AND CONSTRUCTION are the best that can be built. They possess the highest efficiency and insure a minimum loss of time through delays for repairs or renewals.

We will estimate on complete dredges of the bucket type or on all or any portion of the machinery.

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Steam Shovels, Traction Dredges, Dipper and Clam-Shell Dredges, Endless Chain or Elevator Dredges,
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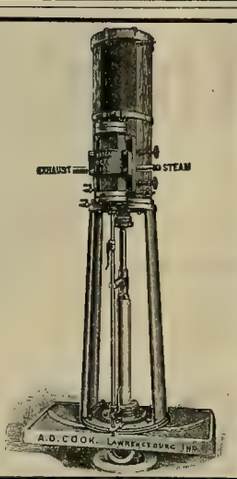

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Wire of all Kinds Wire Rope Tramways, Etc.

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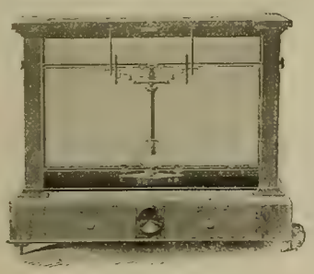

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READY ROOFING.

If it were possible to make a better roofing in the one or more points that go to make a good ready roofing, we would certainly make P & B Ready Roofing better.

Is it not reasonable to presume that if it were possible to make P & B Ready Roofing better, we would have done so during the 21 years we have made and sold this excellent roofing material?

We are continually in touch with every phase of roofing—the requirements, the materials, facilities, etc., so we know the roofing business and we make the very best roofing that science, facility and money can put together, and we call that roofing P & B Ready Roofing.

FIRE—P & B Ready Roofing will resist fire—firebrands and coals will not ignite it. Insurance companies class it with roofs of tin and iron. We have many letters endorsing its fire-resisting qualities.

WATER—Water cannot injure it—cannot get through it—and it cannot rot it. P & B Ready Roofing is absolutely water proof.

GASES--FUMES—While gases and fumes, heat and cold, rot, decay and deteriorate tin, iron, shingles, slate and tar, it has no effect whatever on P & B Ready Roofing. We have never heard of fumes, gases or smelter smoke causing the slightest injury to P & B Ready Roofing.

SUN HEAT has not the slightest effect on it—won't expand, crack or melt it, or cause an odor to arise. Furthermore, P & B Ready Roofing is a non-conductor and no matter how hot the sun shines down on your building, heat cannot get through P & B Ready Roofing, and it won't impart heat, so your building is cooler in summer and warmer in winter. Cold weather does not make any difference either.

SNOW won't remain on a sloping roof covered with P & B Ready Roofing or go through a flat roof made of it. Up in Dawson and Cape Nome we have sold thousands of rolls, because it will stand the climate with wonderful endurance.

ACIDS—We know of no acids that are likely to affect it while on the roof. Acids compounded by smoke, fumes, and rain water won't hurt it one bit.

CONVENIENCE—P & B Ready Roofing is certainly convenient, if it is anything. It is about ⅛ of an inch thick and 32 inches wide and put up in rolls containing enough roofing to cover 200 square feet. The weight per roll is from 90 to 120 pounds, according to grade. It is compact, does not weigh very much—is not bulky or hard to carry. You can take it in your trunk if necessary, or you can put it on horseback or in a light buggy, and that is something you cannot do with tar, slate, iron, tin or shingles.

AND AGAIN—It don't cost much to ship it—the freight rate is very low.

But last, and above all, is its durability, strength and quality—once it is on your building that is the end of your troubles.

Rain may pour; snow may come and wind may howl; heat can boil and gases annoy, but your roofing is proof against them all and your building protected. Your mind may rest free and easy, for you will not have any roofing troubles to bother or roofing expenses to pay.

We are always glad to give further information—write for it.

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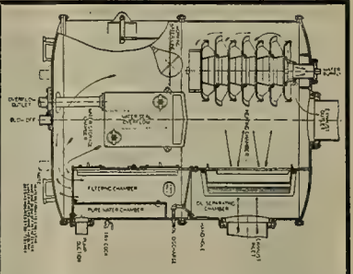
We don't use a governor,

BUT—

WE GUARANTEE our automatic wheel, WITHOUT A GOVERNOR AND WITHOUT ATTENDANCE, to maintain a better speed regulation than any other form of governing WITH SKILLED ATTENDANCE INCLUDED.

Cassel Automatic Water Motor Co.

SEATTLE, WASH.



How the

Stilwell Heater

Heats and Purifies the Feed Water.

The exhaust steam from the engine enters the oil separator on the upper right-hand side of the heater. The oil separator is one of the vital parts of an open heater and is a subject upon which we would like to give you a few points before you purchase a heater. Oil should never be allowed to enter the boiler.

From the oil separator the steam passes into the heating chamber and mingles with the cold feed water as the latter flows in little cascades over a series of "settling trays." The water is heated to the boiling point and at the same time any mud and carbonates of lime and magnesia that it may contain are precipitated in the trays. These substances would otherwise enter and incrust the boiler, requiring expensive cleaning and repairs. The heater trays, however, are removable through a door and the deposit can be quickly pounded off. The uncondensed steam passes out through the exhaust outlet at the top and may then be used for heating or may escape to the atmosphere.

The heated and purified feed water falls into an ample settling chamber, where the finer sediment settles to the bottom. The level of the water in this chamber is controlled by a float which controls the valve admitting cold water at the top of the heater. An overflow arrangement is also provided, by means of which it is possible to skim the surface of the water in the chamber.

From the settling chamber the water passes **upward** through the filtering chamber, which is tightly packed with fibrous material, and then through the pure water chamber out to the pump suction. Upward filtration prevents floating particles from passing over to the boiler and is peculiar to the Stilwell heater.

Send for our BOOK "MS" on Feed Water Heating.

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DAYTON, OHIO, and all large cities.

Builders of PUMPING MACHINERY, WATER WHEELS AIR COMPRESSORS, and POWER PLANT APPARATUS.

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A specialty. Round slot or burred slot holes. Cast Steel or American planished Iron, Zinc, Copper, Brass or Tin Screens for all purposes. **CALIFORNIA PERFORATING SCREEN CO.,** N. E. cor. Fremont & Howard Sts., San Francisco.

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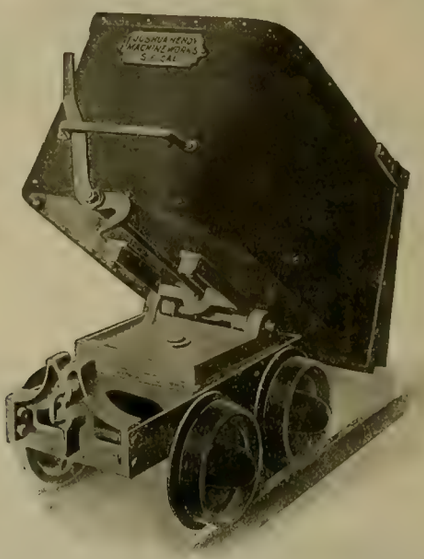
TO THOSE WHO KNOW
The "HENDY" ORE CARS



BUT LITTLE NEED BE SAID.

To those who do not know, we would be pleased to send a full description of the best Mining car made, being almost entirely built of steel and having self-oiling boxes. Wheels heavily chilled; with dust-proof caps, double bottom, either automatic or hand side and end dump.

Send for descriptive catalogue and prices before purchasing.

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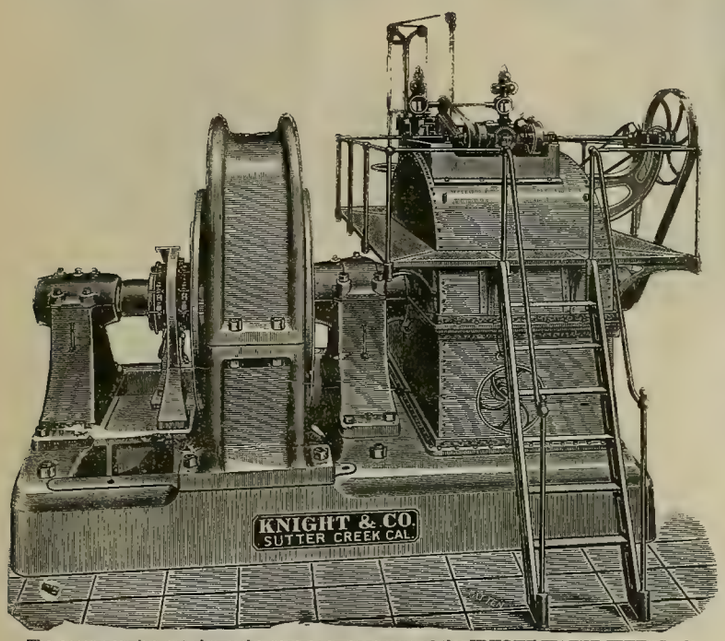
KNIGHT'S WATER WHEEL.



The accompanying cut shows the general arrangement of the KNIGHT WATER WHEEL, direct coupled to a 750 kilowatt generator, with governor mounted on top of wheel casing.

These wheels are designed for 100 to 2500 H. P. HIGHEST EFFICIENCY AND REGULATION GUARANTEED. **Wheels from 6 to 24 inches,** enclosed in cast-iron casing. Wheels for Mill and Reversible Hoisting Works a specialty.

For full particulars, send for descriptive catalogue. **KNIGHT & CO., SUTTER CREEK, CAL**

FULTON IRON WORKS, No. 17 First St., San Francisco, Cal., Agents for the Knight Water Wheels and Centrifugal Pumps

The Pierce Gold Separator

and Amalgamator

—FOR—

Mills, Cyanide Works, Dredges and Placers.

These Riffles will save more gold than plates. Can be dressed and cleaned up without stopping the mill. Will save slimes that float on top of the water. Takes only from 2 to 8 square feet of space in mill and has nearly 12 feet amalgamating surface in length. Capacity up to 50 tons each in 24 hours.

Write for Catalogue 10.

L. S. PIERCE, Patentee and Manufacturer,

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Weston Standard Voltmeter

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Smelting Works at Ladysmith, Vancouver Island, B. C.

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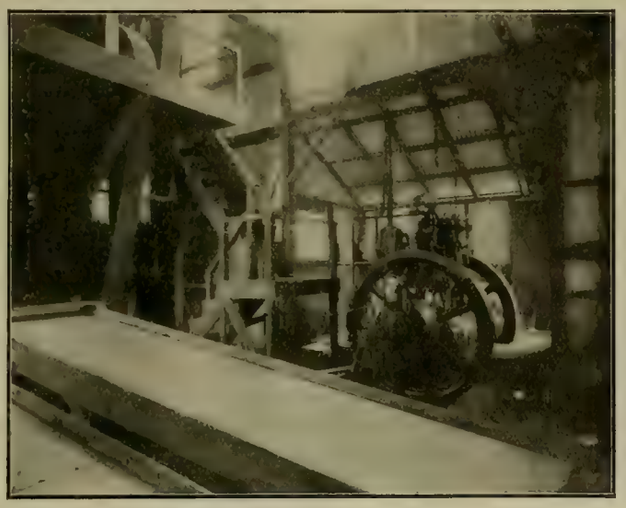
CRANE VALVES

ESTABLISHED 1855

"UNION" GAS ENGINES.



40 H. P. "UNION" STATIONARY ENGINE, FITTED TO RUN ON CRUDE OIL.
Property of Ingomar Con. Gold Mining Co., Campo Seco, Calaveras County, California.

WHAT THE USERS SAY:

SAN FRANCISCO, CAL., December 28, 1905.

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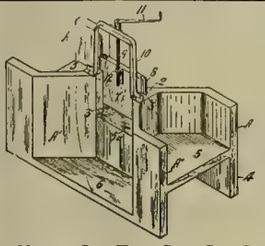

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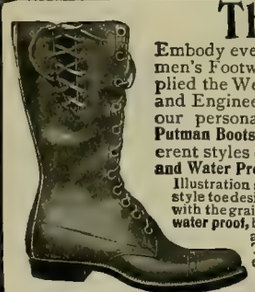

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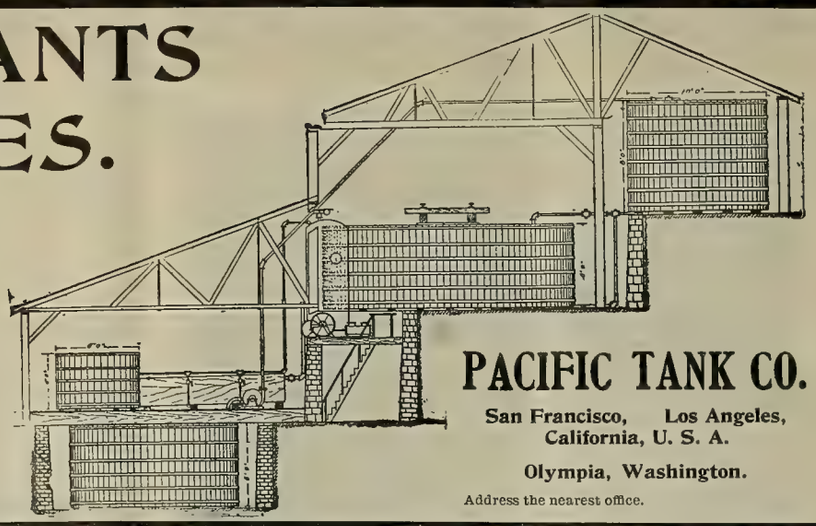

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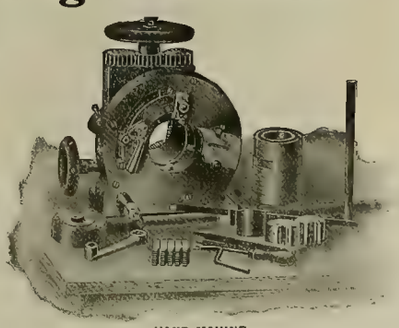

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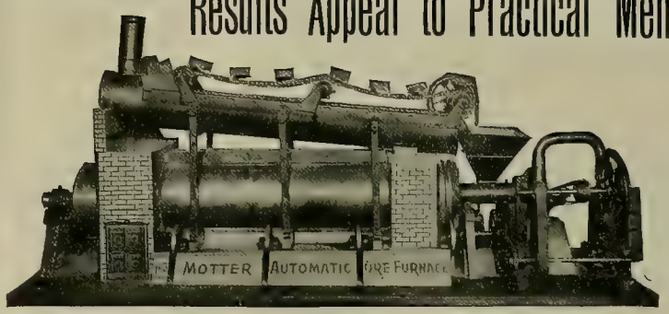

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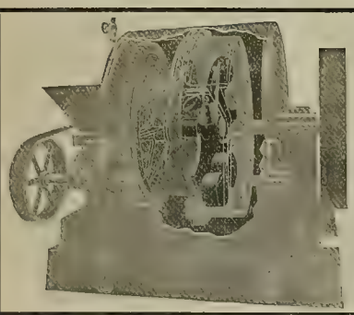

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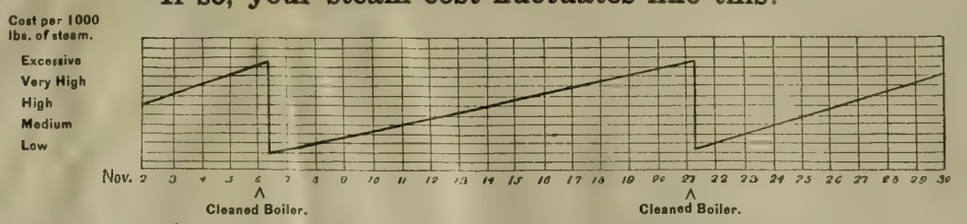

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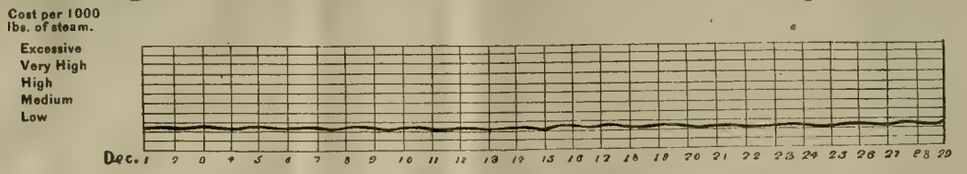

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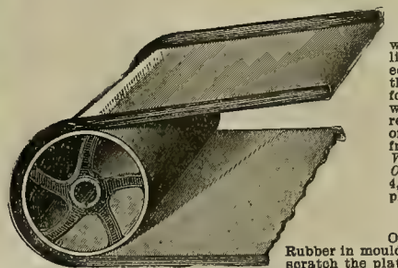

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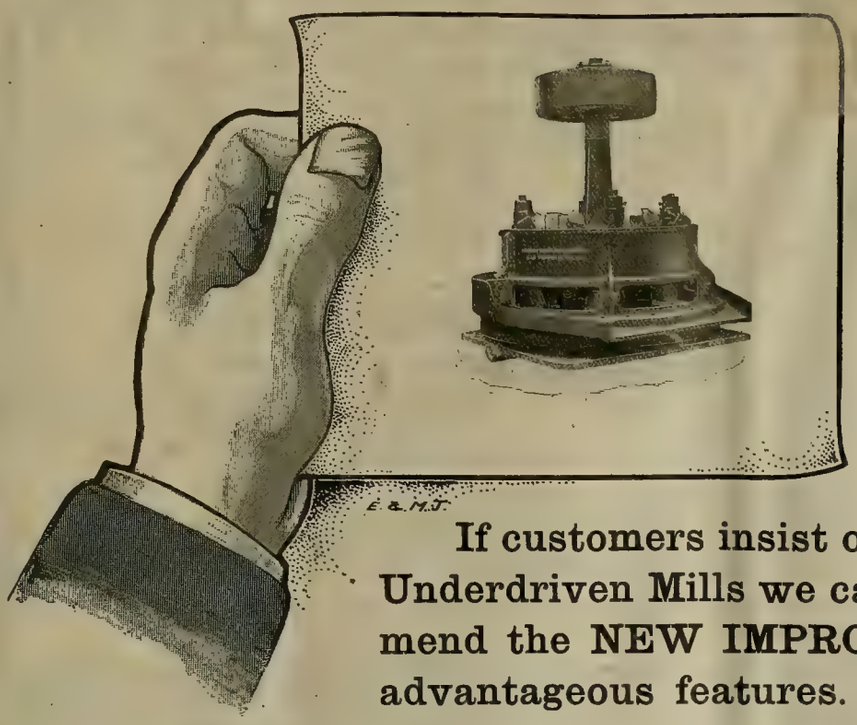

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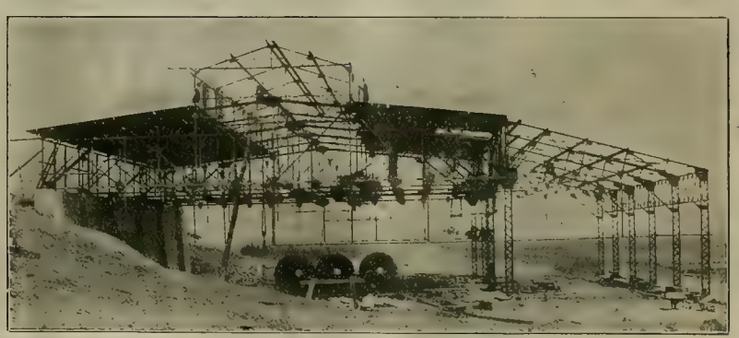

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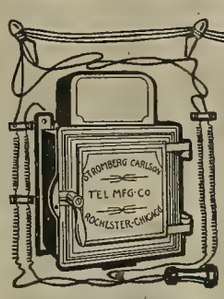

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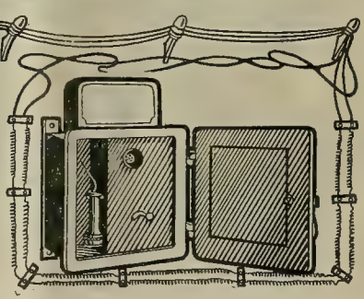

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SAN FRANCISCO, JANUARY 13, 1906.

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EDITORIAL.

COMMENCING with this issue, the reading matter has been moved forward so as to precede the bulk of the advertising pages. We believe that the change will please our readers and, by pleasing them, serve the best interests of those who advertise in the MINING AND SCIENTIFIC PRESS. The editorial matter has been moved forward in place of the illustrated page that formerly came first, it being considered best that, as the proper entry into a house is by the front door, so the introduction to a journal should be past its list of contributors, its contents and its editorial comment.

ANOTHER mining excitement is reported from Nevada, this time at a locality about eighty miles northeast of Goldfield. We hope it will prove to be important, for the direction of the discovery is away from the recent trend of prospecting and, if it is of any consequence, it will mean an important extension of the desert mining region.

GREAT shortage of cars is reported on the Mexican Central. The railroad company is giving preference to clean lead ores, as against the more silicious silver-lead output of the mines. In consequence, there has been much delay in the sale of ore, and we learn that one mine in the Santa Eulalia district has actually been unable to ship its production for six months for this reason.

STATISTICS are proverbially subject to error, but they are often made so needlessly. Some of our readers may have noticed last week a wide discrepancy between our figures of gold and silver production as compared with the same data furnished by the Associated Press to the local press. In every instance the daily newspapers made two serious errors. They omitted the output of Idaho, so that the totals given were wrong by $1,500,000 as to gold and over $9,000,000 wrong as to silver. Furthermore, 59,000,000 fine ounces were given as dollars, although the value of the silver produced by the United States was actually, at the average price for the metal, just 61 per cent of that amount. Even editorials were written commenting upon the precious metal production of the country, without any explanation of the apparent statement that the output had grown in value from $32,000,000 to $59,000,000; while as a matter of fact it had increased to $36,000,000.

The Lesson of 1905.

The year just expired is remarkable in our annals for the flood of literature bearing upon corruption in the business life of the country. Lawson's lampoons, the Tarbell dissections of the Standard Oil Corporation, the magazine articles on the beef trust, on municipal corruption and on the iniquities of insurance, have opened the eyes of the most guileless to the manner in which liberty has been turned to license and freedom of opportunity to predatory finance. Many thoughtful men hail these exposures as a harbinger of better things and as tending to prevent similar facility for wrong in the future. We believe that the use of periodical literature to expose corruption has demonstrated the tremendous power of the printed word, but we hold also that unless the result be to make wrong-doing abhorred and to make wrong-doers despised, unless the moral conscience of the people is awakened to logical action, the ultimate effect will be distinctly bad. If we are merely to be made familiar with the workings of corruption and the machinations of the unscrupulous, if people in high places are to be pilloried by the press simply to make a passing sensation, then we shall become morally callous. Unless exposures of wrong serve to prevent their repetition, they will only blunt the sensibilities of people and may even suggest to the evil-disposed the use of methods which were previously unknown. It will be altogether bad for the youth of the country if this or that man, whose nefarious practices have been laid bare, continues to hold his social position and resumes his business prominence, as soon as the storm has blown over. If the president of a railroad company steals by the rebate system, or if the director of the insurance company robs the shareholders by using a position of trust to feather his nest, is it to be wondered if the train conductor pockets fares or the office clerk empties the till? The actions of the small men are held to be contemptibly wicked, while those of the big fellows are deemed clever merely because of the difference in the scale of the operations. If you borrow $5 from an acquaintance and fail to repay, you are anathema, quite properly; but if you get $100,000 from him and others, by skillful misrepresentation, under cover of business, circumventing them by legal proceedings, you may be labeled shrewd and successful.

The fact is that two standards are recognized, one for personal affairs and one for business. 'Business is business' is the modern buccaneer's motto. There are two codes, and people play hanky-panky between them. It is proper to play the game according to Hoyle with your friends, but when you step into the outer arena of the financial world, it is deemed right to lay aside nice sensibilities and to deal from the bottom of the pack; the code is that of the ruffian in Arizona, or "the bad man from Bodie." People smile at the article in a newspaper which demonstrates that an acquaintance stole a million from the city, by bribing its officials or by failing to carry out a contract in honest fashion. They think such a man smart and do not hesitate to invite him to dinner. If he stole their watch or the silver spoons on their mahogany table, they would rate him an unspeakable scoundrel. Bah! The highwayman who took his life in his hand when he held up the wayfarer was a sportsman compared to the financial magnate who sandbags his associates under cover of business; the pirate, who flaunted his black flag and took the risk of being sunk by the first frigate he encountered, was a hero compared to the trustee, who, under cover of his directorship, secured loans for himself on flimsy security. The buccaneers of today are not finer gentlemen than those who flourished in Raleigh's time. Not very long ago Mr. Hadley of Yale suggested that trust magnates and others who debauched the public life of the country should be socially ostracized. Yet Mr. Depew is a trustee of Yale University and presents of money have been accepted by Mr. Hadley officially from Rockefeller. The links of social life are strong and the danger lies in the inability of the people to muster sufficient courage to break them. The talk of punishing the great corruptionists is theatrical; it lacks sincerity. Until it is recognized that stealing on a big scale is as mean as petty larceny, that bribing through an intermediary is as dishonorable as doing it oneself, that the law cannot condone a theft or sanctify a wrong, until then all the writing of the publicists will fail of effect. No community and no country can expect enduring prosperity so long as the recognized code governing its industrial activities is founded on a quicksand of shifting morality.

An Ancient Fallacy.

It is astonishing how foolish ideas survive. We are in receipt of a long and well-worded letter from Washington, signed by an admiral, in which we are recommended to make the purchase of certain shares of a mining company operating at Leadville. We wondered at the courtesy of the eminent naval authority until next day when we received an elaborate prospectus from a well-known promoter residing at New York, accompanied by a letter stating that the prospectus was sent "at the request of" the aforesaid admiral. Certainly not by our request, for we have known Leadville long ago, and would not ask for reliable information through such picturesque sources as these. What an absurdity it is, and how pathetic! An officer of the navy, honored by his colleagues and the owner of a splendid record of service, lends his name to industrial enterprises concerning which his opinion is as valuable as would be that of a cyanide expert regarding the construction of a submarine boat. The company bears the admiral's name and the prospectus contains a report prepared by the promoter, together with a jumble of excerpts and statistics taken from various sources. Fragments are quoted from the published geological writings of A. A. Blow, Francis T. Freeland, Max Boehmer and C. J. Moore, and the authors of the prospectus even know enough to talk of a Professor Emmon, misspelling the name of the greatest of all the authorities on Leadville. Not content with these curious doings, they quote from the columns of the daily press, as though they were a reliable guide

in choosing mining investments. What a vaudeville is to a tragedy, that the performance of this admiral and other retired military and naval gentlemen dabbling in mining affairs, is, when compared to the late Lord Dufferin and his sad experiences with Whitaker Wright. How soon are such object lessons forgotten! It is not long since that certain other retired ornaments of the two services undertook to lead trusting investors through the byways of mining, only to lend their good names to a tricky promotion. Such performances will cease when they, and the public, learn that it is absurd for men, who have spent the whole of their lives in other pursuits, to venture to give advice to, or to act as trustees for, mining investors. Let the admiral stick to his ship, the general to his batallions, the shoemaker to his last.

MINING men interested in the geology of ore deposits will find it profitable to read Mr. Walter P. Jenney's article on the fissure system of the celebrated Ontario lode. The author explains how the mineral solutions, that formed the ore, changed their passage-way from one lode-channel to the other. As to which of the resulting veins is to be given precedence, it is hard to say. It is related that at the time when the Daly and Ontario mines were making their maximum production, there was some rivalry between the shift-bosses of the two properties, although they were under the same management. When a stranger was shown through the Ontario he was told that "the Ontario was a great mine and that the ore held strong going west until the Daly vein robbed her. The Ontario was alright until she struck the spur-veins, but she was no good after that." When, however, the same visitor went underground at the Daly, the shift-boss who accompanied him would be almost sure to exclaim that "the Daly was a fine little mine and had good ore going east until the Ontario robbed her, and then she just quit." Those who read Mr. Jenney's article will see that the difference in the point of view is the result of structural conditions of unusual interest.

The Mining Congress.

On another page we publish an authoritative communication concerning the aims and present status of the American Mining Congress. We were among those who had a poor opinion of this organization until we attended one of the annual sessions and found that it had the support of several men of character, actuated by motives it was impossible to misconstrue. The Congress is gaining dignity by mere age; it lives, despite early vagaries, and each year it wins further consideration. The reading of pseudo-scientific papers has been lessened, the second-rate mine-promoter is not so much in evidence, the mere seekers after temporary notoriety do not crowd the meetings, but gradually men of reputation have had their interest awakened to the point of attending the annual sessions, which are held as far apart geographically as the imperial boundaries of the United States will permit. The desire to see a national Department of Mines, with a Secretary or a chief otherwise designated, is the principal spur to an increase of interest. This is evident from the number of officials belonging to the Geological Survey who find opportunity to read papers and otherwise make an appearance before the Congress. Incidentally, we venture to express the hope that the unwieldy bureau over which Mr. Walcott presides will not be further enlarged, but, on the contrary, that if any development is to take place it may be that known in biology as generation by fission, the forestry and irrigation annexes being given an independent existence so that they may not smother the scientific corps that constitutes the original body of the Survey. But that is another subject; to return to the Congress. We would like to see mining directly represented in the national Government and we believe that the time will come when a subdepartment will be created under that of Commerce and Labor. Our enthusiasm would be much keener if we might expect politics to be eliminated from such a direct relation between the industry and the Government. However, even under the imperfections inseparable from existing conditions, there is reason to believe that such an innovation would be of much benefit to the exploitation of the mineral resources of our country.

Electricity versus Air.

Comparisons between the use of compressed air and electricity are frequently made by the superintendents of mines and mills. Electricity is the wizard of the modern world, and it is not surprising that those who use it imagine that it must supersede all other forms of applying power. Last week we published the confident claim of an electrical engineer and this week there comes a reply in behalf of compressed air. We are glad to see the subject discussed by so experienced an engineer as Mr. Edward Rix, and expect that his letter will interest many of our readers. Electricity has done marvels and in large mines, operated continuously, it has proved economical for pumping, hoisting and tramming. But many a small mine has been prematurely loaded with an electric equipment, ill adapted to intermittent work on a small scale, merely with the idea of being up-to-date. In regard to rock-drills, Mr. Rix has the best of the argument, for, while there are several clever machines on the market, they are yet on trial. No one is looking out more keenly for the electric drill of the future than the big manufacturers of compressed-air machines, and it is certain that the inventor of an accepted type of electric drill will get a first-class reception from everyone interested in mining.

Of course, the electric drills now on the market suffer from being an innovation, and even where they have been tried in mines they have been too hastily condemned. When the old Burleigh drill was first introduced, the miners treated it pretty roughly, disliking to see hand labor superseded. Now they know that the introduction of air-drills has made room for more workingmen by permitting more mines to operate at a profit; they have become accustomed to it. When first taken underground and started to work by an expert, the electric drill also may do well, but as soon as it is turned over to the rough handling of a man who prefers to use air, the operation of the machine becomes unsatisfactory and the superintendent is eventually compelled to discard the use of it. Electricity underground is still a new thing, but it is becoming more familiar every day. This increasing familiarity will help the electrical drill. There are many managers of large mines quite willing to give a fair trial to such inventions and, with the aid of ideas suggested by actual practice, there should be a successful result in the near future.

In regard to the ventilation question, we have always been of the opinion that to ventilate a heading with compressed air is an expensive luxury, at the best. When low-grade oil is used, it is no luxury at all, but a menace to health. One suggestion we venture to offer; and that concerns the waste of air by leakage. It is poor business to expend power in compressing air and then to let it escape through faulty pipe-joints. Many a leak have we seen, and heard, which was wasting more than enough air to run a drill. A good manager ought to instruct his shift-bosses to keep a careful eye on the air-piping and to avoid a source of loss, which is much greater than generally supposed. If you want to employ air for ventilation, use it where it will do good; don't expend it on a draughty crosscut.

ONE of the most successful mining enterprises on record was the Associated Syndicate, organized in 1891, at Adelaide, to prospect in Western Australia. There were six men in it; of these, three were tailors, one was a hotel-keeper, another a jam maker, and the last, but most important, a prospector named Harry Pearce. This man went to Kalgoorlie and 'pegged out' (or located) most of the productive portion of that famous goldfield. The original subscription of the six adventurers was £50 per man; starting with this capital of $1,500, their original holdings within four years had a market value of $7,500,000 per share. They did not retain the ground until development had proved its maximum value, but they held interests and shares which made each of them a rich man. The ground originally located by them became the site of one of the great goldfields of the world—Kalgoorlie—and the basis for stock operations on a tremendous scale. The success of this syndicate and of others of the same kind illustrates the fact that the 'sport' of mining, the taking of chances in prospecting, is still profitable, and that the most money is to be made by buying mines when they are young, leaving it to the more timid to minimize risks by buying ore reserves. The greater risk is compensated by the possibility of a bigger reward.

By the Way.

A distinguished citizen has said lately that:

In the long run the one vital factor in the permanent prosperity of the country is the high individual character of the average American worker, the average American citizen, no matter whether his work be mental or manual, whether he be farmer or wage-worker, business man or professional man.

In our industrial and social system the interests of all men are so closely intertwined that in the immense majority of cases a straight-dealing man who by his efficiency, by his ingenuity and industry benefits himself must also benefit others. Normally, the wage-worker, the man of small means and the average consumer, as well as the average producer, are all alike helped by making conditions such that the man of exceptional business ability receives an exceptional award for his ability. If the less fortunate man is moved by envy of his more fortunate brother to strike at the conditions under which they have both, though unequally, prospered, the result will assuredly be that while damage may come to the one struck at, it will visit with an even heavier load the one who strikes the blow. Taken as a whole, we must all go up or go down together.

The corporation has come to stay, just as the trade union has come to stay. Each can do, and has done, great good. Each should be favored so long as it does good. But each should be sharply checked where it acts against law and justice.

If we of the American body politic are true to the traditions we have inherited, we shall always scorn any effort to make us hate any man because he is rich, just as much as we should scorn any effort to make us look down upon or treat contemptuously any man because he is poor. We judge a man by his conduct—that is, by his character—and not by his wealth or intellect.

Business success, whether for the individual or for the Nation, is a good thing only so far as it is accompanied by and develops a high standard of conduct—honor, integrity, civic courage. The kind of business prosperity that blunts the standard of honor, that puts an inordinate value on mere wealth, that makes a man ruthless and conscienceless in trade and weak and cowardly in citizenship, is not a good thing at all, but a very bad thing for the Nation.

We can get justice and right dealing only if we put as of paramount importance the principle of treating a man on his worth as a man rather than with reference to his social position, his occupation or the class to which he belongs. Individual capitalist and individual wage-worker, corporation and union, are alike entitled to the protection of the law, and must alike obey the law.

To approach the questions which inevitably arise between them solely from the standpoint which treats each side in the mass as the enemy of the other side in the mass is both wicked and foolish. Unless we continue to keep a quick and lively sense of the great fundamental truth that our concern is with the individual worth of the individual man, this Government cannot permanently hold the place which it has achieved among the nations.

It is the man's moral quality, his attitude toward the great questions which concern all humanity, his cleanliness of life, his power to do his duty toward himself and toward others, which really count; and if we substitute for the standard of personal judgment, which treats each man according to his merits, another standard in accordance with which all men of one class are favored and all men of another class discriminated against, we shall do irreparable damage to the body politic.

In the year ending June 30, 1905, there came to the United States 1,026,000 alien immigrants. In other words, in the single year that has just elapsed there came to this country a greater number of people than came here during the 169 years of our colonial life which intervened between the first landing at Jamestown and the Declaration of Independence.

As much as possible should be done to distribute the immigrants upon the land and keep them away from the congested tenement-house districts of the great cities. But distribution is a palliative, not a cure. The prime need is to keep out all immigrants who will not make good American citizens.

In dealing with this question it is unwise to depart from the old American tradition and to discriminate for or against any man who desires to come here and become a citizen, save on the ground of that man's fitness for citizenship. It is our right and duty to consider his moral and social quality. His standard of living should be such that he will not, by pressure of competition, lower the standard of living of our own wage-workers, for it must ever be a prime object of our legislation to keep high their standard of living. It will be a great deal better to have fewer immigrants, but all of the right kind, than a great number of immigrants many of whom are necessarily of the wrong kind. As far as possible we wish to limit the immigration to this country to persons who propose to become citizens of this country, and we can well afford to insist upon adequate scrutiny of the character of those who are thus proposed for future citizenship.

CONCENTRATES.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

AN electrolyte is a solution which is decomposable, or is subjected to decomposition by an electric current.

IN order to legally locate a mining claim on the public domain the locator must first make a bona fide discovery of mineral in place.

CARBON DIOXIDE may usually be detected by passing the gas into lime water, or into an ammoniacal solution of barium chloride, when it gives a white precipitate of the carbonate.

THE waste heat from reverberatory and cupola furnaces can be utilized in many ways about reduction works—a little ingenuity being all that is required to make it available.

THE crushing weight of dry yellow pine is about 4,500 lb. per sq. in. Wet and green timber is not nearly so strong as dry timber, and this fact should be remembered when timbers are bought for immediate use in the mine.

MANY of the most important mines of Mexico are in andesite—chiefly gold mines. The principal lead-silver deposits in that republic are in limestone. Of these the mines of the Sierra Mojada and of Santa Eulalia are examples.

THE increase in mining cost at great depth is often offset by better organization, perfected methods, higher extraction of values and a surface equipment more completely suited to the requirements of the mine and reduction of the ore.

CONCERNING underground waters, the general principle is established that underground streams are treated on the same principles as surface streams, and such underground streams can be appropriated and utilized, the same as a surface stream.

THE specific gravity of aluminum is 2.68; its electrical conductivity by the Matthiesen scale is 61; its tensile strength is 22,000 to 30,000 lb. per sq. in. Its coefficient of linear expansion is .0000167 per degree F., and the coefficient of temperature resistance is .00214 per degree.

WEIR measurement of water flowing in streams is not reliable where a large volume of water is passing. That method of water measurement is as accurate for large amounts, however, as the measurement of water through slots under a head of 4 to 6 inches.

THERE are known to be mineral deposits in the Big-horn mountains of Wyoming, but up to the present time nothing of payable value has been developed. The geology of that region suggests the possibility of good mines there. The prospects thus far known are mostly of lead and silver.

ORDINARILY salts are more soluble in hot than in cold water, though in some cases the reverse is the fact. Some salts, soluble in cold water, form insoluble basic salts on heating, making the solution cloudy. There are a few salts only very slightly soluble in water. Calcium sulphate (gypsum) is an example.

GREAT DEPTH in mining is not always synonymous with largely increased water—in fact the, deepest mines in the world are comparatively dry and many of them are dusty in the lowest levels, and water must be taken below for drilling and other purposes. In most deep mines the greatest volume of water is encountered above 1,500 ft. from the surface.

A LARGER number of incandescent lights is always more satisfactory than fewer arc lights underground, for the reason that by the use of the former there is a better distribution of light and the intense shadows characteristic of arc lights. All incandescent lights are not uniformly good. The cheaper grades usually give a much lower efficiency, and are therefore not economical.

A MINING CLAIM located at any time during 1905 required no assessment work during that year (except in those States requiring work as a part of the act of location, which is not required in California), and no work need be performed during 1906 until December, when the first $100 worth of work may be done. It is better to do the work as soon as possible and to do as much as possible, for an undeveloped mining claim has little value.

IN hard-drawing copper wire the texture of the surface of the metal is changed by rolling or hammering, so that the outer portion is rendered dense and hard, and its tensile strength thereby increased, but although the surface of the metal is thus effected, the center remains practically unchanged. When a wire which has been subjected to the hard-drawing process has this outer portion injured by cracking, or it is annealed, its mechanical properties are at once impaired.

FLUMES in cold countries can be protected by covering with plank, and by giving fall sufficiently heavy to produce a rapid current, but no splashing of the water should be allowed to occur or icicles will form, which will result in the flume being clogged with ice. Ditches are in successful operation in South Dakota, where the temperature goes to twenty or more degrees below zero each winter.

ONE of the factors in the low cost of mining at the Homestake mine is the high specific gravity of the ore, which require but 10 cu. ft. to the ton in place instead of 13 as usually figured. Most quartz ores run about 13 ft. to the ton, but the large mass of gold-bearing rock in the lower levels of the Homestake is mostly hornblende schist, carrying considerable iron sulphide—up to 10%, and very little quartz. This easily accounts for the high specific gravity of the ore.

IN timbering drift mines, the method of support depends on the nature of the ground. The usual method is that of posts and caps, arranged either singly or in connected series. In some drift mines the roof stands so well that little timber is required, and the larger boulders are stacked up in heaps, being retained by walls along the gangways. These piles of rocks afford sufficient support to the roof, not more than one-third of the excavated area being given actual support.

THE publications of the U. S. Geological Survey are for free distribution, with the exception of the topographic maps and folios of the geologic atlas of the United States and the monographs. The publications consist of monographs, topographic maps; folios, in which are bound topographic and geological maps; bulletins and professional papers. Full information concerning these can be obtained by addressing the director of the United States Geological Survey, Washington, District of Columbia.

CYANIDE SOLUTIONS should always be calculated by the ton. The employment of gallons in these calculations is obsolete. To figure the amount of solution a tank will hold, square the radius of the tank (inside measurement) and multiply by 3.1416. This gives the area of the bottom. Multiply this by the depth of solution in the tank—to find cubic contents—all measurements being in feet. Multiply this by 62½ lb., the weight of 1 cu. ft of water, and divide by 2000 lb., which will give the tons of water or solution in the tank. A tank 30 ft. in diameter and 10 ft. deep will hold about 220 tons.

OCTAGONAL and circular shafts are occasionally sunk for mining purposes, but are not in common use. There are shafts of these shapes in Mexico 2000 ft. deep. In American practice the rectangular shaft is considered the most practical and useful. The shaft is divided into two or more compartments, in some instances as many as six. These are arranged either in a straight line or in a double line, with an equal number of compartments on each side of the center. L-shaped shafts, such as the Forman shaft sunk jointly by the Overman and Caledonia mining companies, on the Comstock Lode at Virginia City, Nev., are not in use elsewhere. That shaft had four compartments.

ROUGH ASSAYING is very unsatisfactory. It may be sufficient where it is only required to know that the rock tested is sufficiently rich, without doubt, to meet all expenses of mining transportation and treatment, but where the margin of profit is small, something more accurate than 'rough assaying' is necessary. To be proficient the assayer must have a good knowledge of chemistry and mineralogy and, as well, be equipped with a good assay outfit. Although the assay of ores is largely mechanical, the business requires much care and makeshifts are never satisfactory in assaying. Accurate results require careful manipulation, experience, and first-class materials in the way of fluxes, etc.

ON an incline the pressure of a loaded car on the plane of the incline is equal to the natural cosine of the angle of inclination, and the tendency of weight, or backward pull, down the plane is equal to the natural sine of the angle. Thus in a shaft at 65° inclination each ton of 2,000 lb. of the load is 1,812.6 lb. The friction varies, however, not as the sine of the angle, but as the cosine, and its amount is determined by multiplying the weight of the load by the cosine of the angle, and the product by the coefficient of friction. The coefficient of friction in well-constructed straight inclined shafts is small, and due mostly to friction in wheel bearings, sheaves and stress of rope, and that in the hoisting engine itself.

BLANK location notices can be obtained usually at any place dealing in blank legal forms of any kind, particularly in the mining States. The notice required for a relocation is similar to that placed on an original location. It is a good idea not to change the name and to state in the location notice that it is a re-location. A new discovery is not necessary, but a new discovery stake should be set up upon which the notice of re-location is posted, allowing the notice of the former proprietor to stand. This will distinguish the location from other and original locations. A relocator may transfer a portion of his interest in the claim to another whose name is not on the location notice. This makes the partner an interested party to the claim with the same rights as the original locator.

ALTHOUGH timbers subjected to compressive tests by hydraulic presses are compressed from 3 to 4%, and often split and fly to pieces, yet timbers taken from mine caves in the Comstock have been found distorted in shape and compressed to less than one-third their original thickness without splitting or being otherwise injured, and were found so hard as to make it almost impossible to drive a nail into the pieces. The specific gravity of the timber had also greatly increased, due to the increased density of the wood. The timbers were from a caved stope and had been soaked in the scalding water of a flooded portion of the mine for several years. Timbers originally 14 to 18 in. square when placed in the mine were found twisted into rhomboidal shapes about four inches thick and a foot long in cross-section.

TRANSITION CURVES are used and considered necessary in railway construction, but such engineering refinements are seldom attempted in mines, except in shafts where the shaft changes from the vertical to an incline, or from one angle of inclination to another. In such cases where rapid winding is the custom a properly constructed curve is indispensable to safety unless the speed be materially diminished while passing the curve. Side rails of angle iron may be employed in the shaft to prevent the skip leaving the rails on the curve. These side rails, or guides, are secured to the posts of the shaft sets, and placed in such position that they permit the skip wheels to pass between the track rail and guide rail, but sufficiently close to the wheels to prevent them leaving the track rails more than a small fraction of an inch.

IT has been repeatedly stated herein that a co-partner in a mining claim cannot relocate the claim to the exclusion of his partners because of failure to perform the necessary assessment work, thereby profiting by his own negligence. The proper course for him to pursue is to perform the work as required by law and then notify the delinquent partners to contribute their proportion of the expense of this work. Should they fail to pay over the money, then the one who did the work may advertise in the newspaper published nearest the mine, as provided by law, and when all the requirements of the law have been complied with, the title of the property passes to the one who has performed the work required by law, unless in the meantime the delinquent parties pay up their share of the expense of assessment and costs of advertising.

THE cheapest way to roast sulphide ores is in heaps. This method requires the minimum of labor and fuel—only sufficient wood being used to start the ore to burning, the sulphur in the ore supplying the remaining fuel to keep up combustion. Stall-roasting is the next least expensive, being about the same as heap-roasting; but ore roasts in stalls more rapidly than in heaps, and in this respect is more economical. The walls of the stalls concentrate the heat and do away with the necessity of covering the top and sides of the ore pile with fines. Stalls are built both open or covered by an arched roof, as desired, the several stalls being sometimes connected with a stack, to facilitate the roasting process. In heap-roasting there always remains a considerable percentage of sulphur in the ore after roasting —from three to eight per cent.

"A CLAIM HOLDER cannot hold a claim or location for several years without performing in any year the work required, by simply going upon the claim at the beginning of each year and doing a few hours' work, with no bona fide intent to comply with the statutory requirement as to the amount of work done. * * * It is against the policy of the law, and a fraud against the Government and the law, to hold quartz claims by merely doing a few dollars' worth of work thereon at or near the beginning of the year next following the year on which claimant failed to do the necessary work, when such work is not commenced with the bona fide intention of being continued till the full amount is done. Such labor, so done, is a mere pretense and a sham, and will not prevent the relocation for want of necessary work." —Supreme Court California, McCormick v. Baldwin, 104 Cal., 227, 228; 37 Pac., 903.

MILL PLATES should be dressed at least twice daily, and in the event of spots appearing on their surface they should be gone over as often as necessary to remove these, as no amalgam will collect on the yellow, bronze or greenish spots which form on many plates. One good remedy for these spots—produced by copper salts—is an electroplate of silver. If the plate already has the silver plating, it should be given a re-treatment and the amount of silver increased. As a rule too little silver is put on mill plates. The extra expense of the heavier coating of silver will, in most cases, soon pay for itself. Each battery of five stamps should have not less than 150 sq. ft. of amalgamating surface, and more is better. Many mill men will contend that there is no gold passing the lower end of the plate—because they collect so little there. If they gave the lower end as much care as the upper end the result would probably be different.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

ELECTRICITY V. COMPRESSED AIR FOR MINE OPERATIONS.

The Editor:

Sir—I have carefully read Mr. Hulbert's article and in answer to your request for a reply from the compressed-air standpoint, wish to say that Mr. Hulbert does not present any new arguments. The objections he mentions have been urged many times and for many years, and yet compressed air for mining purposes is more in vogue, and more popular at the present time than ever before. The general reason for this lies in the fact that its utility is so great that a power economy is in the majority of cases not a prime consideration; in other words, its commercial economy is in most cases where it is used, greater than electricity. To be more explicit, let us take an example.

It is true that an electric rock-drill will probably operate with one-half the power that is required to operate a compressed baby air-drill. It, however, does not cost over $1 per day to furnish compressed air for this drill, and the miners' wages to run it for three shifts would be $9; that is, a total of $10 per day for power and labor. The electric drill, let us say, takes one-half the power and the same wages, or a total of $9.50 per day to operate it. Now, no one will dispute that the air-drill will do at least one-third more work, making the cost for electric drilling $12.66 against $10 for the same footage of holes drilled by compressed air.

Again, when we come to consider air hammer-drills, we find that they take even less power than the electric drills and will drill more feet of holes for the same expenditure of either power or labor. Furthermore, the electric drills have not as yet proved themselves to be a satisfactory substitute for compressed-air machines, and at present they are not seriously considered by practical miners, and we understand that the larger electrical manufacturers do not recommend them. In coal mining electric drills can not be used at all on account of the fire-damp, neither are they adapted to wet mines or, in fact, to practical rock-drilling under the usual conditions.

It is readily granted that electricity is more economical to produce, but when a mine does not get a chance to take advantage of such economical production in the majority of instances, of what use is the argument? Most mines buy their electric power and are charged according to the peak load. In the case of a mill drive this works no hardship, for the load is nearly constant, but when it comes to a hoist that takes, say, 75 h. p. at the peak, and does not average for the 24 hours, 10 h. p., there is a hardship, and here is where the very uneconomical air compressor is installed; it is driven by a 40-h. p. electric motor, the air is stored in proper receivers during the hoist intervals, and the management pays for 40 h. p. instead of 75 h. p., which again shows that we must bow to commercial economy in such matters.

As to the "ventilation" proposition, fresh air is a by-product in using compressed-air drills and costs nothing, and therefore should not be criticised. It is good air in all the cases that have come under my observation, perhaps because our mines use good lubricating oil of 600° fire test. Certainly, if a criminal management chooses to send into their mines noxious gases incorporated in the air, because they use inferior oil, when a proper lubricant is obtainable, it seems hardly in order to blame compressed air for it. Ordinary light galvanized-iron ventilating pipe is not as readily maintained in a working face as standard pipe, and I should judge that a miner would feel a little more secure at a working face with a good stout compressed-air main than he would with a tin air-pipe and an electric wire. In Paris, where compressed air is sold for power, as well as electricity, a great number of small shops take compressed air to generate their electric lights and other power, in order to take advantage of the cold, pure air exhaust for ventilation and the cooling of rooms and provisions.

Exception must be taken to the general statement that modern rock-drills do not use air expansively, for most of the hammer-drills, the very latest addition to the compressed-air devices, use the air expansively to a marked degree. And even regular piston rock-drills reverse their valves before the piston reaches the front head on the forward stroke and about midway on the backward stroke, thus introducing quite an element of expansion. Regarding the advantages of lighting possessed by an electric drilling plant, this does not appeal to me strongly, as I remember on one occasion fitting up electric lights in order to facilitate work in a tunnel heading, and was requested after a few days' trial to remove it, as the miners preferred candles, because, in drilling, they wanted a light directly at the drill-hole, and claimed that the general illumination was not desirable. Electric light is serviceable in lighting shafts and drifts and for large work, but in a working face it is not of such advantage in the ordinary mine that it would pay to endure the inefficiency of an electric drill to obtain it.

Altitude is not the drawback to the use of compressed-air drills that Mr. Hulbert would lead us to believe. While it is perfectly true that it takes more power to compress a sea-level equivalent at an altitude, the sea-level equivalent is not required, because at an altitude the atmosphere, having less pressure, permits the exhaust from the drill to enter the atmosphere with less work expended. For example, at 10,000 ft. altitude the atmospheric pressure is about 10 lb. only, so that the drill exhausts against 10 lb. back pressure instead of 15 lb. at sea-level; consequently, an 80-lb. air-pressure at this altitude will be about as effective as 90 lb. at sea-level. I am of the opinion that 50 h. p. properly applied to a compressor at ordinary mining altitudes will produce just as many feet of drilled holes as it would at sea-level.

I hardly agree with the last sentence in Mr. Hulbert's article, for the industrial field is a wide one and, judging by the patent office reports, the compressed-air industrial mechanisms are already legion, with more to come, and if electricity is operating any more important or numerous class of mechanisms than air-brakes throughout the world, I would like to be advised. The fact is, that electricity is far from monopolizing the industrial field and is even more dependent than compressed air upon the courtesy of steam, without which at most industrial centers electricity would be an expensive luxury.

Port of La Paz, Mexico.

No matter how great the electric power development in this world, it never can be so great as the steam, water, air or gas motive power that brings it into existence; therefore, viewing the present state of the art, electricity has its marked limitations after all. EDWARD A. RIX.

San Francisco, January 8, 1906.

THE KJELLIN ELECTRIC STEEL FURNACE at Gysinge, near Stockholm, Sweden, has been in operation since 1899, and it is claimed the process will bear comparison with the crucible and open-hearth furnaces in production on a large scale. The record shows that 12,000 lb. of ingots are cast in 24 hours. This furnace is chiefly employed in the regular production of tool steel. The specialties manufactured at the Gysinge works are drills and chisels, forged steel for gun barrels, magnets, etc. The special qualities of this steel are its great elasticity, absolute homogeneity, softness and the high proportion of carbon, together with its excellent magnetic properties.

ELECTROLYTIC COPPER.—The fact that certain mines in the region of the Great Lakes yield a mineral so free from objectionable impurities that a high-grade copper is obtainable directly by the simple furnace scorification, early gave Lake copper a premium in the market that electrolytic competition even yet has not entirely wiped out. For almost all purposes there should be no hesitation whatever to-day in specifying electrolytic copper. In conductivity it is superior to nearly all brands of Lake, and in mechanical properties it leaves little to be desired. There are a few classes of work in which the metal is subjected to very severe punishment, such as in the making of cartridges, where Lake seems to stand up better than electrolytic, although even here it is a question how much to allow for the trade prejudices of the older generation of mill foremen who clung so tenaciously to the perplexing system of wire ganges of but a few years past. Any such advantage in Lake copper must be attributed to the fact that it is not so clean as electrolytic. A small quantity of arsenic, for example, while exceedingly detrimental to the conductivity, will appreciably improve the mechanical properties of copper. At one time arsenic was considered necessary in English specifications for firebox copper. Each year a greater proportion of the world's output is electrolytically refined, and it seems probable that before long there will be but two grades of copper on the market—high conductivity copper, which will include electrolytic and picked brands of Lake, and casting copper, covering all material which will not pass a conductivity requirement of 98% annealed.—Lawrence Addicks in *Journal Franklin Institute.*

Forwarding Supplies to Mexico.

Written for the MINING AND SCIENTIFIC PRESS by EDGAR RICKARD.

The Mexican import tariff covers almost every conceivable article of commerce. The preliminary steps necessary in preparing a shipment to Mexico demand a thorough and expert knowledge of this particular class of work, which must cover the classification, packing and proper weighing of the goods. It is necessary to prepare a manifest in Spanish detailing with utmost accuracy the gross, net and legal* weights (in the metric system), the adopted shipping name and character of each individual article forwarded. All of this is imperative; an error in any one will subject the consignee to costly fines at the port of entry, for the custom house officials of Mexico are very active, for the simple reason that they are entitled to one-third the fines imposed. According to recognized tables a kilogram is equivalent to 2.2046 lb. Adv., but, in making the manifest, brokers use an arbitrary ratio of 2.0361 as a basis. In the description of articles, general names will not suffice—no matter how accurate; in one case recorded at the port of La Paz in Lower California, where a consignment of barley was manifested as 'food stuff,' a fine of $300 was paid by the consignee before he could remove his barley from the custom house. Even when the greatest care is exercised, errors are discovered, or invented, and fines imposed. The Progreso Mining Company has been obliged to pay fines on rulings which would seem ridiculous. A number of cases might be cited. Round ¼-in. boiler packing was manifested correctly as 'packing,' but because it was hollow the officials at La Paz declared it 'hose,' and a fine had to be paid. A consignment of P & B paint, manifested as 'paint,' was declared to be 'varnish,' and, although the company paid the Government chemist for an analysis, the report of the local authorities was sustained; and it is quite likely that the same article manifested as 'varnish' will be declared 'paint' the next time. A dozen one-dollar Ingersoll watches were held in the custom house, because the officials decided that the valuation of one dollar should have been five dollars; one watch was sent, at the company's expense, to the City of Mexico for decision, while two were held in the local custom house for comparison, and after the matter was decided, the officials refused to return the watch from the City of Mexico because only the Government is allowed to send jewelry by mail. The weights are often checked with the crudest scales and, if any inaccuracy is apparent, the consignee suffers. A recent case of this kind will explain. The Progreso Mining Company received a consignment of 50 cases of lard, each correctly marked with the gross, net and legal weights. The cases were first weighed separately and checked. Then the entire shipment (3,000 lb.) was placed on the scales, which at that time were inaccurate for large quantities, and the total weight would not check with the sum of the individual weights in each case. No amount of argument could alter the official reasoning, although the scales were immediately afterward adjusted; months later the company recovered the fine. The greater part of this trouble with the fines and inconsistencies practiced is due to the faulty Mexican system before mentioned, which allows the officials one-third of all fines collected and which makes arbitrary decision possible. For some time the provisions forwarded by the Progreso company were inspected with undue diligence and one bottle or can of each kind was opened; and as it was impossible to forward in an open condition over 35 miles of wagon road, the opened cans and bottles were left at the custom house to be consumed by the officials. The company finally arranged to give all of the opened articles to the agent at the port, and thereupon this presumably careful attention to duty stopped and nothing has been opened since then.

The best advice to probable shippers is to employ only the most efficient brokers at the shipping as well as at the receiving end. Errors are costly, as measured in time as well as money.

CALCIUM can be obtained commercially. The usual impurities are silicon 0.2 to 0.5 per cent, aluminum, 0.2 to 0.3 per cent together with traces of iron. The specific gravity of pure calcium is 1.52. Calcium has been found to be sufficiently tenacious to be drawn into wire as fine as 0.5 mm. in diameter, and these wires have a specific electric conductivity of 16 per cent of that of silver.

THE governmental estimates of copper exports from the United States for the year 1905 are 237,000 tons, a decrease of about 10,000 tons from those of 1904. There was, however, an increase in certain manufactured copper and brass wares, not included in the statistics of copper exports, which would bring the actual exports of copper to nearly 30,000 tons in excess of the previous year.

*The 'legal' is the conventional measure used in the trade, such as a pound of tea, a bale of hay, or a 50-lb. sack of flour. It includes the package and does not always weigh exactly the amount stated.

A Big Pocket.*

By JOHN B. FARISH.

I was a boy, visiting my brother, William A. Farish, superintendent of the Sierra Buttes mine, in Sierra county, California, when the big nugget was discovered, in 1868. Jim Winsted, an old prospector and cattle man of that neighborhood, then told me the story of the discovery of the Monumental mine, and, being a boy, the story sunk deeply into my mind. He stated that about the year 1861 or 1862, some merchants and operators from San Francisco were visiting at the Sierra Buttes mine. As they were riding down the trail one of the mules became obstreperous and engaged in some frantic bucking at one point on the trail. The next morning some of the gentlemen returning on foot were noticing the way in which the mule had scratched up the trail, when, to the surprise of all, one of them picked up a little gold nugget worth about a dollar. They kept the discovery secret but prospected to some extent over the hill without finding the source from which the nugget came. Exhausting their vacation and meeting Winsted, they told him of their discovery and exhibited the nugget. Winsted, William Farish and one other systematically prospected the hill, the method being to pan regularly across the hill, noting the points at which the colors of gold failed to appear in the pan. After determining one such line, their pannings were made along a similar course at a higher point on the hill. Along this second course the limits of the gold were found at points nearer together than in the first, the lower line. The third, fourth and fifth lines were determined until two approximate lines were determined extending up and down the hill, diverging at the bottom and converging at the top. Having ascertained this, they commenced sinking holes and trenching in the soft loam and near the apex; it was not long before they located a little narrow seam of very rich decomposed quartz. The quartz was thoroughly decomposed and sprinkled all through with gold. A sluice box was put in and during the summer some $25,000 or $30,000 was washed out from the surface gravel and material from the shaft, which reached a depth of some 25 ft. At this point the crevice, the gold and everything seemed to disappear, and, though the shaft was sunk a number of feet deeper and little drifts were run in each direction, nothing of sufficient value to encourage further work was found, and the Monumental mine became a thing of the past. Winsted embarked in the cattle business and was quite successful in it until the summer of 1868, when affairs went rather against him. One evening going down the trail from the Sierra Buttes mine to his home near Sierra City with a crow-bar on his shoulder and wondering how he could 'raise the dust,' he passed the old Monumental mine, and it still being early in the afternoon, went into the bottom of the old shaft and with the crow-bar began churning a hole along what appeared to be the line of the crevice that had been so rich above. He dug the hole as deep as he could, pulling the dirt out with his hand. The dirt that was taken from the bottom of the hole he carefully tied in his handkerchief and carried it to his house where panning showed enough encouragement for him to do further prospecting. From this point on I was, as a boy, cognizant of the facts, which as I now remember, were as follows: Honest as the old California prospector usually was, he notified all of his old partners, and the claim which had been abandoned and open to location by any one who desired to take it up, was re-located, all partners having the same interests they originally had. Two men were put to work, an Irishman by the name of John Tierney, who had been educated for the priesthood but who had retrograded, and a Mexican known as Mexican Frank. Sluice-boxes were fixed up and in the first three weeks something over $3,000 was washed out. Wandering around over the hills, I showed up one afternoon at the mouth of the Monumental shaft just after the noon hour and saw Tierney and Frank in the bottom eagerly and frantically chopping and prying in a crevice about 8 in. wide. I called to them to know what was the matter, when Tierney exclaimed in an excited way, "The whole bottom of the shaft is solid gold! Look at that!" And with that he held up a piece that was as large as his double fists which he had pried out. Young as I was, I told him that whatever it was to get it out whole and not break it up. They rather objected to this, saying that it would take too much digging and cost too much, but I insisted, and during the conversation my brother, William, appeared, and going into the shaft, supplemented my request with his orders. The nugget as taken out weighed 103 lb. It was boiled in nitric acid for one afternoon and weighed 97 lb. avoirdupois after being cleaned. Some six or eight pieces of it, varying in size from that of a single fist to that of a double fist, had been broken off before the directions came to take it out whole. Had this additional amount not been broken off, the weight would have been augmented by probably 20 or 25 lb. They continued taking out the rich dirt in the bottom of the shaft until midnight, when it gave out as suddenly as it appeared. The total production at this time was $56,000, of which the nugget formed almost half. One of the interests was sold in the excitement for what appeared to be a very small sum, but though the remaining owners did a great deal of work and expended quite a number of thousands of dollars, nothing more has ever been found in the Monumental mine.

*From the 'Gold Hunters of California,' by Thomas Edwin Farish.

Lake Superior Copper Mines.

According to Horace J. Stevens, the copper mines of the Keweenaw peninsula produced 221,000,000 lb. in 1905, as compared with 208,329,248 lb. the year previous. The increase is less than it was for 1904, but the industry is in an extremely healthy condition. Of the total, the Calumet & Hecla produced 82,500,000 lb. Eighteen mines yielded more than a million pounds of copper. Dividends have increased notably, as the following table shows:

Mine.	1905.	1904.
Calumet & Hecla	$5,000,000	$4,000,000
Champion	1,000,000	200,000
Wolverine	660,000	450,000
Quincy	550,000	500,000
Osceola	384,600	192,300
Baltic	1,250,000	.....
Tamarack	120,000	90,000
Atlantic	50,000	.....
Total	$9,014,600	$5,432,300

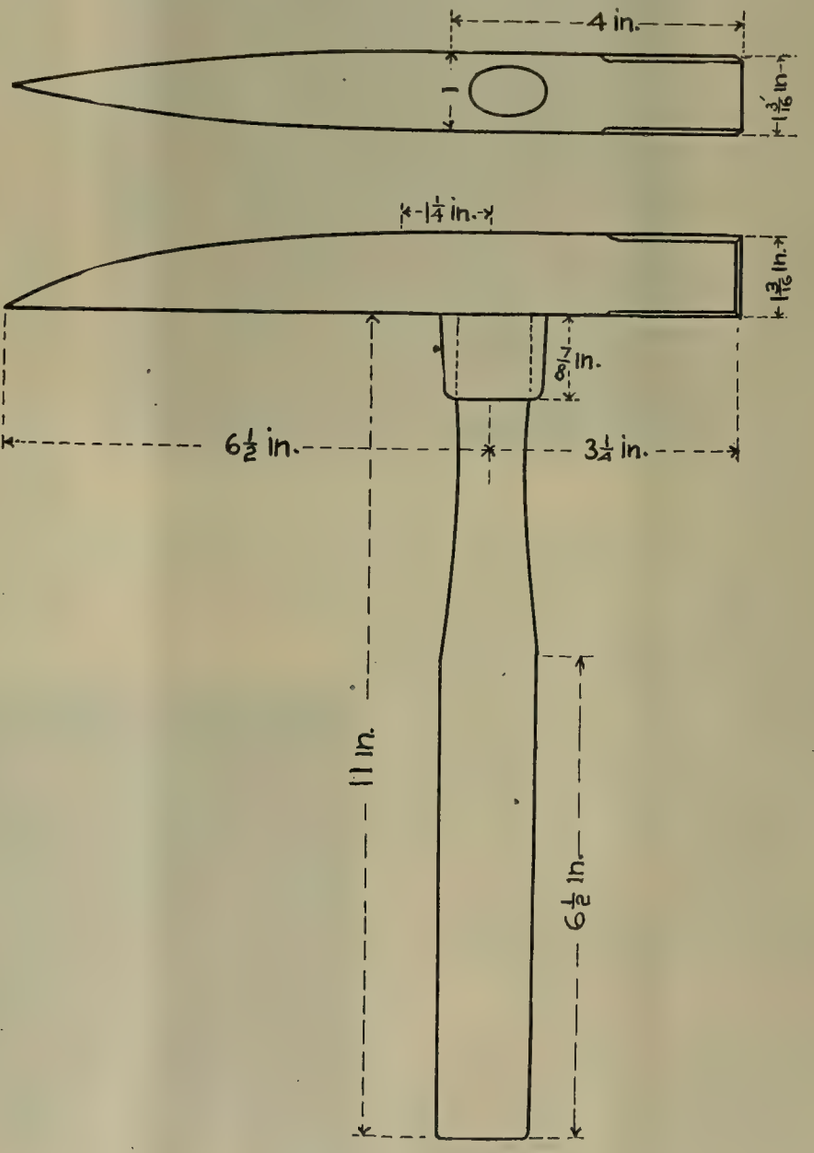
In addition there was $1,540,000 distributed by the Copper Range Consolidated Co., and $279,860 by the St. Mary's Mineral Land Company.

The dividend disbursements for 1905 have been exceeded in total amount during two previous years only. In 1900 the total payments were $9,811,200, and in 1899 they reached the high-water mark of $12,318,450. In that year the Calumet & Hecla alone paid dividends of $10,000,000, due to the company making a large distribution from its immense surplus fund, in addition to paying to shareholders the profits from an unusually good year's business. The 1905 dividends show a much larger aggregate of dividends, from companies other than the Calumet & Hecla, than in any preceding year, and the $5,000,000 dividend disbursements of the Calumet & Hecla by no means represent the total profits. The Lake copper companies could have paid dividends of at least $4,000,000 more than was actually disbursed, from the net earnings of the year, but did not do so, for business reasons that will appeal to all conservative investors. All of the dividend-paying companies have ambitious programs for the future, which will call for heavy outlay for some years to come, and it was deemed better to lay aside large sums for these extraordinary expenses out of the profits of an unusually good season.

Thirteen cents per pound may be accepted as approximately the normal figure for copper, but the price of Lake and electrolytic copper, at the close of the year, is above 18c. As every cent means a bonus of nearly $2,250,000 to the Lake mines yearly, at the present rate of production, the mines are benefiting to the extent of about $1,000,000 monthly from the present high price of the metal. While a portion of this unusual profit is reflected in the dividend declarations, most of the extra profits are going to surplus and into new work.

A Good Form of Sampling Pick.

Notwithstanding the fact that a hand-pick is not a safe instrument for sampling purposes where great accuracy is desired, it is a tool that every manager and superintendent uses constantly. Unfortunately, one cannot go out into the market and buy one that is worth the price, but has to rely upon the pick made by the mine blacksmith. As the proportions of this are important, the present drawing is offered. It will be found to represent an instrument of good shape and proper weight. Such a pick will weigh about 2¾ lb. complete, which is sufficiently heavy for breaking up pieces of rock, knocking off corners and general prospecting work. It should be made of a good grade of pick steel, and the handle must be secured to the head by two cross-wedges of wood and one longitudinal wedge of steel.



A Pick for Use in Sampling.

LAST year the diamonds imported at the port of New York had a value of $30,000,000, and the automobiles imported from Europe were worth about $4,250,000. In both cases the increase of business is enormous and serves to illustrate the luxurious methods of life now prevalent.

Good Mill Construction.

On the opposite page we publish a drawing of the Bustos mill at Guanajuato, Mexico. The accompanying photographs will also serve to illustrate interesting features. In the erection of this plant, bedrock was everywhere available and the heavy masonry walls were built cheaply by Mexican labor, which is particularly adapted to such work. The stamps are of 1,050 lb. weight. The mortars are of El Oro type and weigh 9,000 lb.; they rest upon massive concrete blocks laid in Dyckerhoff cement. The concentrator room is spacious, and has a well designed roof-truss of steel construction. The tailing from the Wilfley tables is in masonry, a concrete launder being carried down the axis of the concentrator room to the center, where it delivers to a tunnel at right angles, and thence to the cyanide annex. While the plant as a whole is being completed, a 5-stamp battery, with its cyanide annex, is being employed for testing the various ores. Even when the 80 stamps are at work, this small addition will be kept in service. In the concentration department of the testing plant there is a Wilfley table, a Gilpin County bumper and an Overstrom table. After being crushed under the stamps, the pulp passes over one of these three machines and then to a sump, whence it is pumped 60 ft. to cone separators. The sand undergoes percolation in vats eight feet deep and eight feet diameter, provided with the Butters hydraulic distributor. The slime is agitated in vats nine feet deep and eight feet diameter; one vat uses the Hobson aero-mechanical agitator and the other a Butters pump with mechanical stirrer. This little testing plant is designed throughout to duplicate the conditions under which the big mill will be operated. The Bustos mill was designed for immediate doubling, excavation for which is now under way. A sufficient space will be excavated back of the present plant to allow of the placing of a second row of 80 stamps on the other side of the bins. A concentrator room, identical with the present one, will be added, so as to make the mill a 160-stamp mill of back-to-back design. Owing to the high price of American lumber when delivered at Guanajuato and the poor quality of the Mexican lumber, it is considered that the use of steel is economical. The plant was designed by Mr. C. W. Van Law, the general manager of the Guanajuato Reduction & Mines Company.

End View of Bustos Mill.

TESTING FOR WOLFRAM.—The mineral is blackish, its weight at once impresses the observer. It would, therefore, not be hornblende, chromite, zinc-blende, tourmaline, or rutile, but might be either wolfram, magnetite, hematite, titantic iron, or tinstone. A piece now very finely crushed give a powder or streak which is neither black nor light-colored. Taking those among which the mineral might be found in the previous tests, it will be seen that it cannot be tinstone (light-colored) or magnetite (black), but, being reddish or brownish, may be wolfram, hematite, or titanic iron. If one now takes a small piece of the mineral and tests it in a blow-pipe flame, and the mineral fuses or melts on the edge or corners, it is, therefore, not hematite or titanic iron, but probably wolfram. Now break from that piece a flake, and the clean, bright sub-metallic luster of a cleavage-face is shown. The presence of the wolfram is confirmed.—*Mining Journal, London.*

SPECIAL ISSUES of the MINING AND SCIENTIFIC PRESS will be issued fifty-two times per annum, one each week. Each issue will contain something of particular interest to the miner, the millman, the smelter and the geologist.

The American Mining Congress.

Written for the MINING AND SCIENTIFIC PRESS.

The American Mining Congress was formed for the purpose of "advancing the mining and metallurgical industries, in all their various branches, within the United States. To assist in bringing about a more perfect co-operation between the Government of the United States and the developing of mining and metallurgy; to encourage education in practical and scientific information in relation to mining, metallurgy and their allied industries; to acquire and disseminate trustworthy information bearing upon the development of the metallic and non-metallic mining resources of the United States; to promote a more co-operative tendency in the evolution of agriculture, mining, manufacturing, transportation and commerce; and for the particular purpose of bringing the mining men of the United States into closer relation with one another, and of promoting a friendly feeling for one another through social intercourse and the discussion of mutual interests."

It would seem that the purposes above quoted are worthy objects to achieve. The American Mining Congress aims to be a national organization. While those who have sacrificed much to make it worthy of its purposes regret it has not achieved more than it has, still they, perhaps more fully than others, realize that the United States is a great country with wonderful business interests and that under these conditions confronting an effort to establish an organization of this character in the confidence of the busy men of this country, requires time, sacrifice and much wisdom.

The question of creating a Department of Mining being one of the purposes of the organization, it has been brought before every session heretofore held. This subject has been ventilated in many ways and at many times, but the program committee at the last session was grievously disappointed in failing to secure the attendance of those who, if present, would have ably discussed the matter. The Congress is planning to advance the interest in this question in other ways than in debating the resolution relating thereto at the annual sessions.

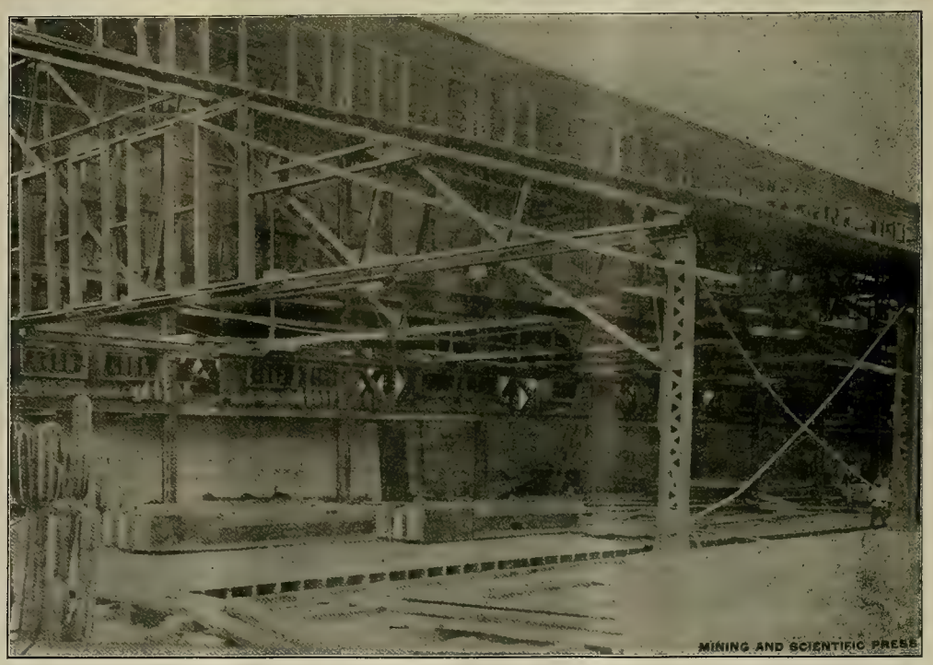
It has been said: "Would it not be a good thing for the Congress to be composed of delegates from the several State mining associations?" This suggestion is good so far as it goes, but there are comparatively few States that have mining associations. Would it be wise to base the existence of this national organization solely on the probability that State associations would exist in each State and that they would send delegates? Those who are selected to guide the work of the Congress deem the organization too important a factor to let its existence rest on so uncertain a basis.

The purpose is to make the American Mining Congress a permanent national organization. There are some who believe that an organization of this character when it demonstrates to busy men (and this takes time) that it can be made an instrument that will be of use to them, it will then, and not until then, receive their co-operation. To do this, wisdom and honesty of purpose must inspire its councils and much work must be done by those who receive no reward but the satisfaction of duty well performed. It is believed by many that this organization so guided can be made the means of giving a wonderful uplift to the mining industry. It is also believed that in this way mining can be largely removed from the speculative and, we may say, gambling basis it now largely occupies in public estimation, and placed more largely on an industrial investment basis.

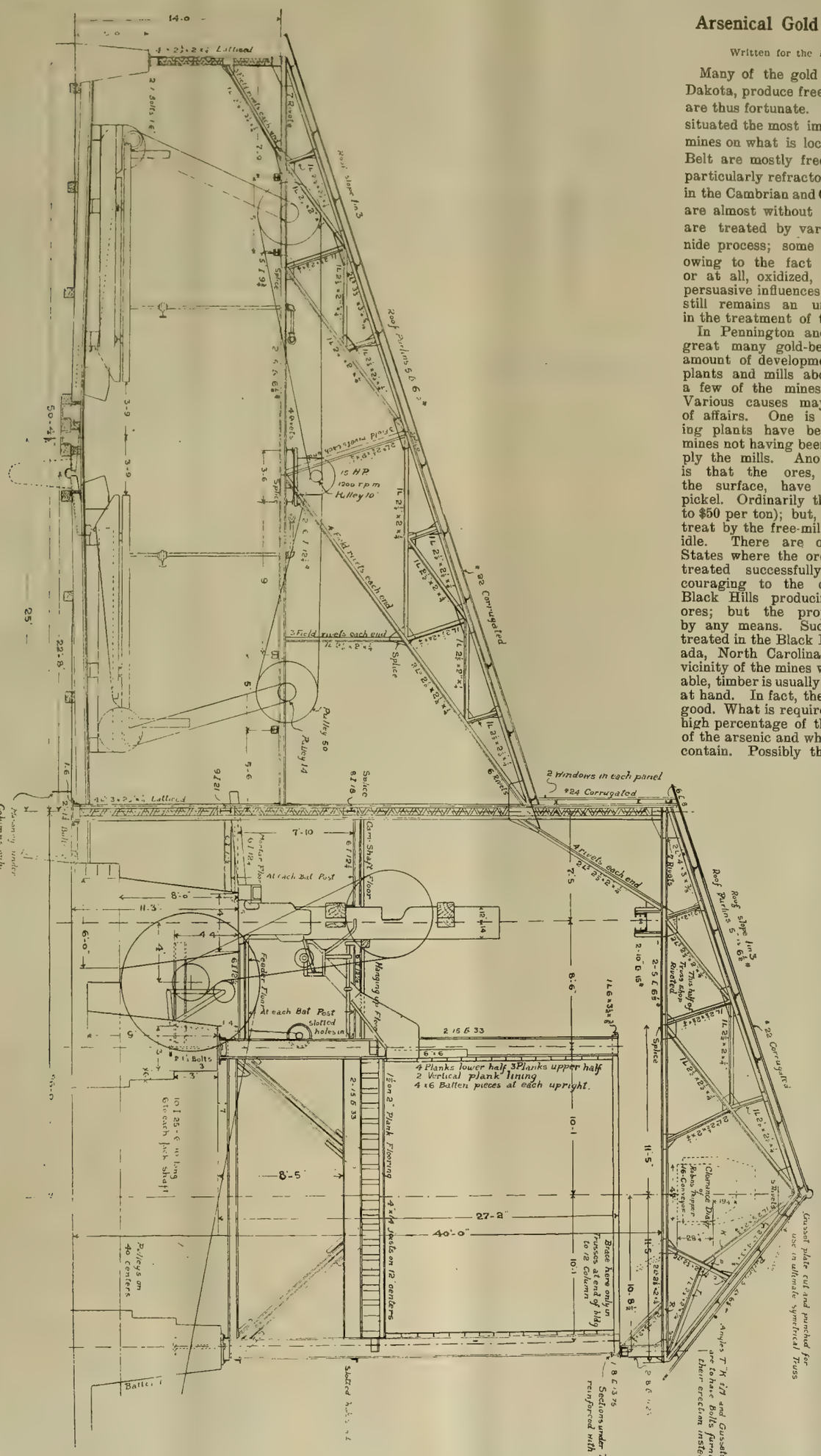
Those who understand real mining are fully aware that mining, if done on the same basis as banking, manufacturing and railroading, is, on the average, more remunerative and safer than other industrial investments. The certain returns that come from coal, iron, oil, copper, zinc, lead, silver and gold mines in our country, demonstrate that merit exists in legitimate mining. Would it not be of service to the American people if this truth could be made to appear and legitimate mining encouraged and illegitimate mining discouraged? To do this requires the assistance of all who are willing to make a sacrifice to this end, and especially mining periodicals.

Those who are selected to guide the work of the Congress during the coming year invite criticism, both as to their work and the work of the Congress. Legitimate criticism, with a purpose to help, would be of great assistance, and frank discussion of these things could only have a good effect.

NO MINE SUPERINTENDENT should fail to crosscut the country for some distance on either side of his vein. There are numerous instances where the failure to perform this very necessary work has resulted in overlooking the existence of parallel veins or masses of ore which were of great value, and which were later discovered by another. Sometimes it is the fear of encountering a heavy flow of water that deters exploration of this kind. If there is good reason to anticipate such conditions, the diamond drill may be used with good effect, both in prospecting for ore and in determining the existence of water-bearing strata in the vicinity.



The Concentrator Room.


14-0
4 x 2½ x ⅜ Latticed
Roof slope 1in 3
Roof Purlins 5 6.2
Splice
15 HP
1200 rpm
Pulley 10
4 Field rivets each end
3 Field rivets each end
Pulley 50
Pulley 14
Splice
#22 Corrugated
6 Rivets
2 Windows in each panel
#24 Corrugated
4 Rivets each end
Cam Shaft Floor
Motor Floor
At each Bal Post
Feeder Floor
At each Bal Post slotted holes in
Hanging up Floor
4 Planks lower half 3 Planks upper half
2 Vertical plank lining
4 x 6 Batten pieces at each upright.
½ on 2" Plank Flooring
4 x 14 Joists on 12 centers
Brace here only on Trusses at end of bldg to 12 Column
Sections under Truss Support reinforced with
Pulleys on 40 centers
Battery
Shafted
Roof slope 1in 3
Roof Purlins 5
Truss shop Riveted
Splice
#22 Corrugated
Clearance Door
Belt Conveyor
Angles T K ⅛ and Gussets N R P i S are to have Bolts furnished for their erection instead of rivets
Gusset plate cut and punched for use in ultimate symetrical Truss
27-2"
40'-0"

Cross-Section of the Bustos Mill, Guanajuato, Mexico.

Arsenical Gold Ores in South Dakota.

Written for the MINING AND SCIENTIFIC PRESS.

Many of the gold mines of the Black Hills, South Dakota, produce free-milling ores, but not all of them are thus fortunate. In Lawrence county, where are situated the most important mines in the State, the mines on what is locally known as the Homestake Belt are mostly free milling at the surface and not particularly refractory in depth. The ores occurring in the Cambrian and Carboniferous sedimentary rocks are almost without exception refractory, and they are treated by various modifications of the cyanide process; some of these, known as blue ores, owing to the fact that they have been slightly, or at all, oxidized, are not amenable to even the persuasive influences of the cyanide solution. There still remains an unsolved metallurgical problem in the treatment of these Black Hills telluride ores.

In Pennington and Custer counties there are a great many gold-bearing lodes on which a large amount of development has been done. Hoisting plants and mills abound in that section, but only a few of the mines are in operation at present. Various causes may be assigned for this state of affairs. One is that these mining and milling plants have been prematurely installed, the mines not having been developed sufficiently to supply the mills. Another cause for this stagnation is that the ores, free milling at and near the surface, have in depth turned into mispickel. Ordinarily the ore carries fair values (\$10 to \$50 per ton); but, as this material is not easy to treat by the free-milling process, the mines remain idle. There are other districts in the United States where the ore of similar character is being treated successfully. The situation looks discouraging to the owners of the mines in the Black Hills producing these auriferous arsenical ores; but the proposition is not without hope, by any means. Such ore can be as successfully treated in the Black Hills, without doubt, as in Canada, North Carolina or British Columbia. In the vicinity of the mines water power is generally available, timber is usually abundant and railroads are near at hand. In fact, the economic situation is unusually good. What is required is a process which will save a high percentage of the gold and make a by-product of the arsenic and whatever else of value the ore may contain. Possibly the most satisfactory solution of the problem would be the establishment of a reduction plant at some convenient central point, on Castle spring or Rapid creek, where the ores from the various tributary districts might be brought and reduced.

Notable among the mines where this class of ore is found are the Holy Terror, at Keystone; the Extreme, near Custer; the Wheeler Hill, on Castle creek, above Mystic. In addition to these, there are many mines near Rochford where ore of a similar kind is produced. In fact, throughout the southern and central hills these arsenical gold ores appear to be characteristic. The veins vary from 1 to 10 ft. in width, and, as far as development has gone, there seems to be a large tonnage that should pay for treatment by proper methods.

ELECTRICAL TRANSMISSION of power is benefiting from the drought in California. The interruption to stamp-milling, by reason of the lack of water power, is prompting mine-managers to instal electric motors, to afford supplementary power sufficient to serve during seasons similar to that which has been experienced lately. This development will lead to the coustruction of more dams high in the Sierras and the organization of new power companies. At Grass Valley and Nevada City the use of electricity has been based on the utilization of the old ditches built originally for the hydraulic mines; but this is true also of the Mother Lode region. The loss of one branch of mining has been the gain of another.

The Fissure System of the Ontario Mineral Belt.

Written for the MINING AND SCIENTIFIC PRESS by W. P. JENNEY.

Two systems of faulting-fissures occur; the mineral-bearing veins and the verticals. All of these fissures dislocating the strata are prior in formation to the deposition of ore; all have courses in the northeast-southwest quadrant (the strike lying between north 10° east, and east, magnetic). Stated in other terms, post-mineral fissures, faulting the veins after the introduction of the ore, and fissures coursing in the northwest-southeast quadrant, seem to be absent in the Ontario–Daly system; at least, so far as the mines are explored. It is, however, true that fissures with courses northwesterly and southeasterly occur in the Wolverine and other mines, along the southerly margin of the mineral belt.

Fig. 1. Plan of Ontario-Daly Vein-System.

The Verticals.—Numerous faulting-fissures occur irregularly distributed over the whole mineral belt; frequently branching and intersecting, they cut through the sedimentary strata, practically at right angles to the bedding. These fissures are 'verticals.' A vertical may be defined as a faulting-fissure, which in the formation of the orebodies has served as a conduit or channel for mineral solutions. Verticals are commonly barren, or carry only small bunches or seams of ore. They have acted as feeders bringing mineral into the veins, and also into favorable horizons in the sedimentary formations; they are, in fact, the tributaries of the ore-shoots. They are distinguished, in most instances, from the veins with which they connect by less mineralization between walls, and by a dip usually reverse to that of the veins; also the striations upon the walls, which mark the direction of the faulting movement, seldom conform in pitch, in these two classes of fissures. When they encounter the porphyry dikes, the verticals pass through the dikes with but slight change in direction.

When examined, these verticals appear to be the resultant of the latest phase of the block-faulting, which produced the larger fissures and veins; they owe their existence to a torsional stress, caused by the irregular and intermittent movement of the different sides of a displaced block of strata. This torsional force, twisting the huge faulted blocks, has given rise to a great number of diagonal fissures, reaching from vein to vein across each of the included blocks. They are thus seen to be an incident of the extensive fault-movements producing the vein-fissures. Frequently, several verticals diverge at acute angles from a common center, and in their course meet other verticals; the different fissures, radiating from distinct foci, intersecting and uniting in the most complex manner. Owing to the nature of their formation, these verticals do not cross from one block to another, but each group terminates in the larger fissures bounding the block in which they originate. Further, the verticals appear, in the ore-forming period, to have afforded channels for the direct escape of the mineral-vapors and solutions from one vein to the next one parallel to it. The verticals also make deposits of ore in flat sheets formed in the areas of intersection, where these faulting fissures in their course toward the surface cut through favorable horizons in the sedimentary rocks; the largest and most extensive orebodies of this kind occur in the gray limestone at the contact with the upper quartzite.

The sketches showing the structural geology of the mineral belt display, better than is possible by any written description, the block-faulting of the strata and the relation and inter-dependence of the veins and verticals. See Fig. 1, 2 and 3. In the Daly–West mine there is developed a prominent belt of verticals traversing the strip of country 700 to 900 ft. wide, bounded on the north by the Roll fissure; this is designated the Trough; it is the main ore-channel, in which is situated the extensive sheet-deposit of the lime-quartzite contact. A number of small blocks of barren strata intervene between the Roll fissure and the Daly vein; as these blocks are followed to the west into the Daly–Judge, they wedge out, so that the Daly vein in the northwesterly part of that mine will, by future development, be found to form the northerly boundary of the Trough. Near the Quincy shaft the Trough approaches within less than 100 ft. of the surface; thence, going west, the quartzite floor is gently inclined through the Daly–West into the Daly-Judge ground and in a distance of a mile the Trough is 1,500 to 1,800 ft. below the mountain crest. To the north of the Daly vein occurs a broad down-thrown block, practically unexplored, reaching north to the Ontario fissure. It is highly probable that explorations will develop other veins and verticals, situated outside the belt described.

As stated, the verticals of each belt terminate at the veins which bound them, being lost in the vein-fissures at the places of their union. They may thus be pictured as interweaving fissures, the bonds of union, the ligaments linking the veins together. Owing to the prevailing uniformity in the strike of all these faulting fissures, the verticals usually intersect and unite the veins at acute angles, varying from 10 to 20°. See Fig. 3. Where the verticals dip in a direction opposite to that of the veins, they intersect in much shorter distances, vertically, than horizontally. Examined more particularly, it is seen that the connecting verticals in each belt or trough, when bounded by veins parallel in strike or dip, depart from the hanging wall of one vein and incline diagonally upward, to an intersection with the foot-wall of the other. In the deeper mines of the camp, it is found that, in depth, numerous new verticals are encountered, which did not occur in the levels above. These deeper verticals traverse the intervals between the master-fissures, binding vein to vein, forming orebodies at their intersections.

The verticals vary in width from a few inches to four or five feet. Though usually barren, certain of the larger fissures carry small, but workable, bodies of ore. It is observed that the veins and the larger verticals show a marked increase in the width of the fissures and in the strength of the mineralization, as they are followed west, as though the dynamic force producing those ore-bearing fissures had come from that direction. In some instances in the western part of the Daly-Judge mine, a union of verticals forms a typical mineral vein, carrying ore in shoots. There are no hard and fast distinctions in Nature, and not only do the larger verticals, particularly when ore-bearing, often closely resemble normal veins, but a number of those in the second or third groups behave much in the same manner as verticals, in the formation of ore deposits in favorable beds, extending laterally from the fissures.

The Veins.—In this part of the district, four groups may be distinguished:

1. Great fissure veins or lodes, of which the Daly and the Ontario are types. These are the master-fissures of the mineral belt, coursing northeast and southwest, to east and west, magnetic, with dip to the north. They carry ore in long continuous shoots, which pitch uniformly westward.

The Ontario and Daly veins are placed *en echelon;* where they lap one another, the ore channel shunts from vein to vein through the medium of a series of smaller cross-fissures spanning the interval of 600 to 700 ft. The more important of these cross-fractures, known as 'Spur-veins' No. 1, No. 2 and No. 3, carried ore in nearly vertical shoots reaching from the hanging wall of the Daly to the foot-wall of the Ontario. See Fig. 1. So complete, during the deposition, has been this short-circuiting of the circulating waters, that the Daly fissure contracts to a mere seam after passing the belt of spur-veins and cannot be identified in the Ontario workings to the east of this connection; while to the west of the intersection, the Ontario vein does not show any evidences of having been invaded by the waters depositing the ore. Viewed from the standpoint of the miner, the practical effect of this was to make the Daly vein the westerly extension in ore, of the Ontario.

In addition to the 'spur-veins' which are local in occurrence, the Ontario and Daly lodes were impregnated with ore in the most intricate way, through the wide-spread systems of intersecting veins and verticals having a source deep-seated in the igneous core of the mountain. They thus dominate the country in which they occur, drawing their mineral through multiple feeding-fissures that gather to the main lodes the diffused circulating waters of a broad zone.

Each ore-shoot appears to have its individual tributaries, although the uniformity in the composition of the ore indicates a common origin or source of the mineral-bearing waters. From this localizing cause arises the peculiar occurrence in these mines of ore-shoots that do not reach to the surface and which, when followed in depth, are found to terminate, the vein becoming barren below the line of intersection with some tributary fissure; also of isolated bodies of ore surrounded in the fissure by non-mineralized ground, and on the other hand, the existence both in the course of the lode and the dip, of remarkably regular and persistent shoots, formed by the coalesced deposits of a number of verticals.

Viewed thus, the fissure is merely the receptacle for the ore, the place of its deposition, but not the conduit (save possibly in a subordinate way) of the up-flowing waters which formed it. In this respect there is a close resemblance between the shoots of ore in the veins and the sheet-deposit of similar ore in the gray limestone on the quartzite contact; in each instance the intersecting fissures furnish the path of the incoming waters. It will be shown, however, that there exist evidences in the orebodies that the solutions which formed the ore in the veins were different in chemical composition from the solutions replacing the limestone beds.

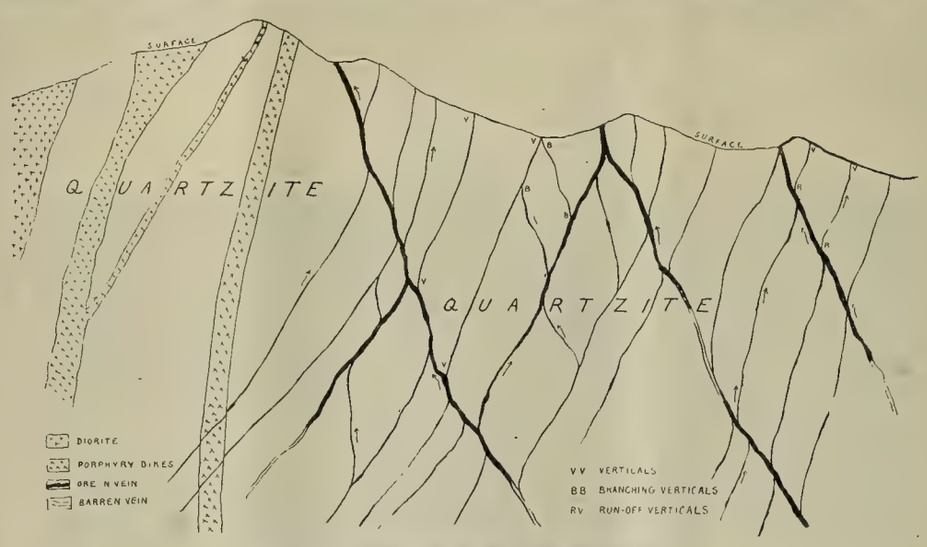


Fig. 2 Cross-Section Showing the Vein-System.

The conditions under which this type of fissure vein occurs in the Ontario belt may be classified as follows:

a. The main lodes of the system dip in a direction away from the igneous core of the mountain, departing in depth further and further from the origin of the ore-depositing circulation.

b. The lode-fissures were formed by an independent dynamic effort following the flank of the mountain-uplift and not its volcanic axis.

c. The fault-movement creating the lodes was in each instance at least 500 ft.; the induced torsional stress in the intercalated blocks giving rise to multiple fissuring, forming the verticals.

d. The nature of the country rock—the hard crystalline quartzite and limestone, shattered and fractured by even small crustal movements, greatly

favored the formation and the preservation of the fissures. Such rocks afford clean fractures and a matrix or fissure-filling permeable to the circulating waters.

2. Fissure veins striking north 20 to 30° east, magnetic, and dipping southeast, including the Back vein of the Daly-West and Daly-Judge mines, and the 'South' vein of the Daly mine.

3. Diagonal fissures, coursing from north 60° east, to east, magnetic, intersecting (on the strike and also on the dip) the veins of the other two groups. The principal fissures of this class dip

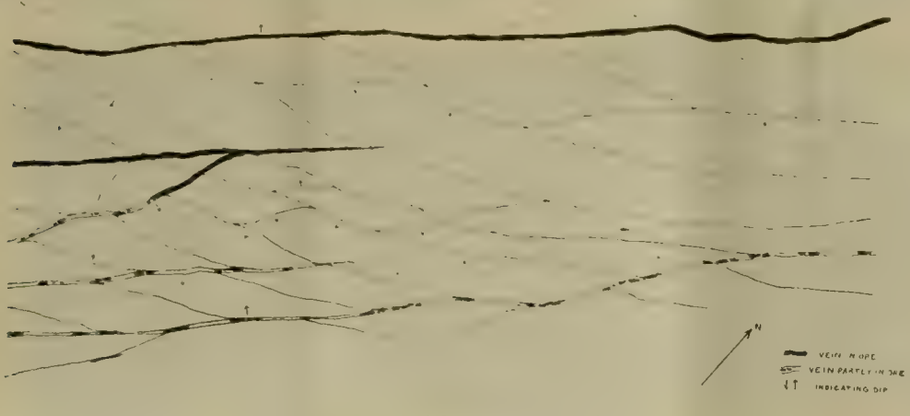


Fig. 3. Plan of Intersecting Verticals.

south; but their branch veins, diverging from the main fissures in their course toward the surface, dip toward the north. Examples of mineral-carrying fissures of this character are seen in the Roll fissure and its branches in the Daly-West mine, and also in the system of branch veins crossing the interval between the Daly vein and the Back vein in the Daly-Judge. The veins of this class appear to terminate where they intersect the Daly vein.

4. Older cross-fissures with strike north 10° to 20° east, magnetic. This system is nearly vertical in attitude, the prevailing dip being east; in some instances when followed either on strike or dip, the fissure turns over and locally reverses its dip. They are usually strong fractures faulting the strata and are in turn faulted by the lodes and veins of ore, namely, the Ontario-Daly system. In the ore-forming period, certain of these cross-fissures appear to have escaped mineralization; others carry long and regular shoots of ore. The American Flag mine, in the hanging country of the Ontario, has been opened to a depth of 1,100 ft. upon a productive fissure of this class.

The so-called 'spur-veins' above referred to, bridging the country between the Daly and Ontario veins, are the faulted section of a belt of similar cross-fissures, which in the deposition of the mineral have been captured by the up-flowing waters and have formed the paths or conduits in the escape of the solutions from vein to vein. In no sense can they be regarded as spurs; they are interlacing veins springing from the hanging wall of the Daly across to the foot-wall of the Ontario.

A NEW LIQUID CHEMICAL compound named 'zorene,' discovered by a Hungarian chemist, is said to possess very remarkable properties. A piece of friable slag, after immersion in it, defied the blow of a heavy hammer. The same effect was produced on brick. Immersing substances in the compound seem to render them impervious to water, as shown by tests in which no additional weight was observed after long soaking in water. Two pieces of steel, one of which had been soaked in the liquid, were submitted to an ammonia test equal to an exposure of five years in the air. The soaked specimen showed no effects from the ammonia, while the other was badly corroded. If these statements prove true the discovery should have considerable commercial value.—*Iron Age.*

THE USES OF ALUMINUM.—Aluminum is successfully used in place of copper as an electrical conductor. If 100 be assumed as the conductivity for copper, 62 is that for the same length and cross-section of aluminum wire. The density of copper is 8.95, that of aluminum 2.67. Assume copper at 18c. per lb. and aluminum at 35c; with like conductivity the cross-section of the aluminum wire is $\frac{10}{6}$, or 1.61, that of copper wire being placed at 1. Under the same conditions the weight of aluminum is 1.61×2.67, or 4.3; that of the copper is 1×8.95, or 8.95. The price, therefore, for aluminum stands at 4.3×0.18, or $1.405, and for copper at 8.95×0.18, or $1.61. With smaller initial cost, less cost of transportation and erection, greater durability and lower cost of maintenance in its favor, aluminum is not so extensively used because of difficulty in making joints, sag due to large coefficient of expansion, and insufficient strength of the wires ordinarily employed for telegraph and telephone lines. A small percentage of copper added to the aluminum increases the strength of the wires, but decreases the conductivity.

Arts of the Mine Promoter.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

The successful promotion of mines is no ordinary occupation, nor is the successful mine promoter an ordinary individual. Many who have a little mining knowledge and a smattering of geology feel competent to write a prospectus for the promotion of a mining property in the belief that it will not be a difficult matter to interest capital in the scheme. There is a very wide range in the character of prospectuses—as wide as the range of character of the men who write them; but all prospectuses are not equally good—some of them are decidedly bad, particularly for those who are misled by them. Prospectuses are prepared for various classes of people. The prospectus which excites the cupidity of the uninitiated and inexperienced small investor would probably have no attractiveness whatever for the mining man of experience; and one which would appeal to the latter would, in all probability, find no favor with the former. Prospectuses—honest and to the point—are written by experienced engineers, for mining men whom the promoters know will understand, believe and appreciate the statements made therein, and, if seeking investment, look further into the proposition and probably interest themselves in it. This matter-of-fact prospectus fails to attract the inexperienced man. He sees little in it to induce him to part with his savings.

The statements are too tame, the promised reward too small, and the time of realization all too distant to lure him into making an investment, and yet this prospectus, shorn of all 'glittering generalities,' containing only the information the experienced investor requires, and this information truthful, complete and reliable, would probably lead the investor more surely to success than many propositions couched in terms more remarkable for their magnificence than for their regard for the truth.

Prospectuses often contain the most astounding statements—descriptions of vast veins, with values into the hundreds of dollars, and sometimes into the thousands—statements which no sane or experienced person would believe, and yet these are not infrequently the allurements which secure the money of the unsophisticated.

A mining man not long since said of a promoter: "He is a fine fellow—socially—and a hard worker, and he is successful, too, but he will lie. If the vein is 10 ft. wide and goes $7 or $8 per ton, he will insist with the greatest earnestness and enthusiasm that the vein is 25 to 30 ft. wide and carries from $15 to $20 per ton. He says, 'what is the difference; the mine is all right, and those who take the stock are sure to win anyhow, and, then—how do I know but the vein may not be 30 ft. wide and go $20 or more a little deeper?' "

A man who can allow his belief in a mining property and his enthusiasm in its promotion to carry him away to the extent of misrepresenting the property by 100% to 200% or more is certainly a dangerous person to follow. His argument usually is, "Tell the truth and you will sell no stock." With him "the end justifies the means," and he takes the desperate chance of making profuse promises, which he himself does not believe, but which he endeavors to persuade other people to accept as unadulterated truth. Ordinarily, he is not in it at the finish, but will be found to have disposed of his stock and departed for other scenes—perhaps to find another bonanza mine that possibly he can promote in the same manner elsewhere.

Occasionally these fakirs go to great expense in the preparation of their propositions. Numerous photographs are prepared to illustrate the property. The prospectus is gotten up in elaborate style, and typographically is a work of art. The minutest details of expenses and operation are gone into; sample returns, maps, photographs and drawings accompany the report. Sometimes diamond drill holes are plotted on a sheet, showing in detail every change in rock formation passed through and the assay value of veins—usually sufficiently high to make the vein or orebody appear as a valuable asset, though later it may be found that the alleged values are not obtainable, or the drill holes may never have been bored at all, the dishonest promoter knowing it will take months to discover the falsification.

Where such elaborate preparations are made to place a mine, it is often the case that the property described has little or no actual commercial value, either present or prospective. This is not of infrequent occurrence. In these matters it is often difficult for the possible investor to discriminate. His best safeguard in such cases is the name of the person or persons making the report. If the statements are made over the signature of well-known, reputable engineers, it is more than likely that the statements, no matter how apparently extravagant they may appear, will be found to be borne out by the facts, but if the signers of such prospectuses are obscure and unknown, as well as the property, it is generally safe to let it alone.

On occasion promoters buy or lease newspapers to aid in their promotion schemes, and the literature which emanates from some of these institutions often affords much amusement for mining men who chance to read the alleged scientific reports on unknown and undeveloped mines. Such expressions as 'granite shales,' 'lime dikes,' 'volcanic veins,' 'plutonic replacement,' etc., are not uncommon. One of these descriptions recently stated that the "ore from the 20-ft. vein didn't go quite $1 per lb." How much less than $1 per lb. it contained was not stated, but it may be safely assumed that it was nearly 99c. less, and probably even worse than that. The various paragraphs on 'secondary enrichment,' 'the increase of value and width with depth,' and comparisons with the greatest mines of the world, to which they bear not the slightest resemblance, all are amusing to the initiated, but to the unfortunate ones who are without experience these are evidences of profound knowledge and extensive experience.

THE PROSPECTOR.

The rocks from Holmes, Wyo., are: No. 1, impure limestone, somewhat silicified. It contains very finely distributed pyrite. No. 2 is a dark basic rock (diabase probably), with schistose structure. It contains a great deal of magnetite. No. 3 is limonite (brown iron oxide.) No. 1 and 3 may contain gold and should be tested for the presence of that metal.

The rock samples from Ely, Nev., have been determined as follows: No. 1 gossan (iron oxide). This ore probably covers a deposit of sulphide mineral (chiefly iron), and possibly also copper. No copper shows in the ore, which is completely oxidized, but if gold is present it should be detected by careful panning. No. 2 is an ore consisting largely of silica, iron oxide and copper carbonate. It should be assayed for gold and silver. It is a promising looking ore. No. 3 is limestone and contains some very finely disseminated iron sulphide and crystals of iron oxide. This may also carry precious metals, and should be assayed for them. The Prospector makes no assays. No. 4 is an iron-stained limestone, and is possibly mineral-bearing, but is not so promising in appearance as No. 3. No. 5 is quartzite. It shows no particular promise of precious metals, but if gold is present it should be detected by panning. No. 6 is quartz, in which are seen galena (lead sulphide) and chalcopyrite (yellow copper sulphide). This is a concentrating ore. All of the above rocks are interesting and the most of them give promise of values, the presence of which can only be told by assaying.

The ore from Priest lake, Idaho, marked No. 1, is limonite. It may be from the gossan of a deposit of copper ore, although all the copper has been leached out. The light gray rock, No. 2, is metamorphic, and consists of silica grains and small plates of mica, and finely disseminated iron ore.

The rock specimen from north fork of John Day, Umatilla county, Or., is pegmatite in contact with a silicious mica schist.

The bluish white crystallized mineral from Los Angeles, Cal., is kyanite, also called disthene. It is described by Dana as a basic metasilicate. $(AlO)_2SiO_3$. This mineral occurs in Los Angeles county, Cal., and also abundantly in the Cargo Muchacho mountains in San Diego county, Cal. It has no particular value at present.

The samples from Kitchener, B. C., are: No. 1, dolomite containing gray copper ore (tetrahedrite). No. 2, a dike rock containing small veins of dolomite with gray copper and zinc blende. No. 3, chiefly limonite and quartz, with little hematite, and chalcopyrite. Undoubtedly this is from the iron cap or gossan of a copper deposit. No. 4, limonite from which all the traces of copper have disappeared, if it ever contained any.

North Mountain Power Plant.

Among the power-transmission systems of the Pacific Coast, that have been constructed with an eye to the future, one of the most interesting is that of the North Mountain Power Company. This is placed in the central part of Trinity county, California, two miles below Junction City, where Canon creek, from which the water used for power is obtained, flows into the Trinity river.

The altitude is about 1,480 ft. All material, cement and machinery were hauled over 60 miles of the severest mountain roads, across three distinct divides. It required 18 to 20 animals to pull each of the larger pieces, weighing 18,000 lb., up the grades, and when mud was encountered it was necessary to hitch 18 animals to the fall of a block-and-tackle fitted with steel cables. Despite these difficulties, however, no mishap occurred to any of the machinery.

Eighteen-Horse Team Hauling Part of a 750 K.W. Bullock Alternator.

The water used at the plant is diverted from Canon creek, which has a drainage area of 52 sq. miles above the diverting dam. The upper part of the basin is a rugged, glaciated granite country, reaching to an altitude of 9,000 to 10,000 ft. above sea. level, where some snow remains throughout the year. The higher parts of this basin are in the nature of an immense amphitheater, lying on a flank of Thompson peak. And, as is so often the case, the converging and descending glaciers have scooped out immense holes with almost perpendicular sides, which now form the beds of two lakes. These have been utilized as storage reservoirs. Part of the watershed is heavily timbered and lies within the boundaries of a government forest reserve. This will insure the preservation of the forests, which are so effective in steadying the run-off. The average annual rainfall for the last 33 years at Weaverville, 12 miles from the plant, has been 42.5 in. At the higher levels of the watershed the precipitation is much greater, but no records are available because the country is absolutely uninhabited.

The dam is small, and serves merely for diverting the water. It is of the usual rock-filled crib form. The ditch system consists of alternating sections of ditch, flumes and one tunnel. Part of the ditch is cut in solid rock, but most of it is dug in the side-hill soil, which stands well and puddles well.

The flumes are 19 in number and vary in length from 30 to 1,200 ft. Those immediately below the dam are laid upon a solid bedrock bench and equipped with adequate spill-ways, waste-gates and sand-boxes. The total length of flume is 5,250 feet.

A tunnel 1,821 ft. long has been driven to replace a temporary flume which was unavoidably built upon treacherous sliding ground. This tunnel is heavily timbered throughout its entire length, and tightly lagged except where the rock is unusually hard. The dimensions of the main tunnel are 4 ft. 9 in. by 5 ft. 10 in. in the clear. The total length of the ditch, flumes and tunnel is seven and a quarter miles. The average grade of all is 0.00184 or 9.73 ft. per mile.

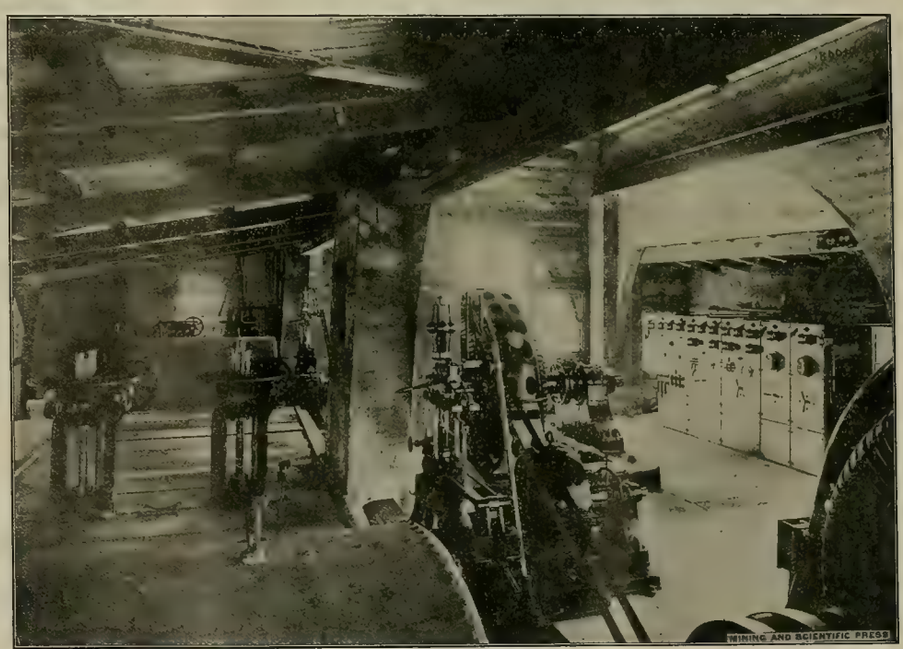
The ditch is provided with waste-gates and sand-boxes at suitable places. The capacity of the ditch is 80 cu. ft. per sec., which is sufficient to operate at full load three units like the two which are now installed. Near its lower end the ditch passes through a gap in the narrow ridge separating Canon creek from Trinity river and terminates in a forebay on the river side of the divide.

A telephone line extends from the power house along the entire course of the ditch to the head dam. Instruments are placed in the station, the forebay tender's cabin, the head-gate tender's house and at several other points along the line. Portable telephones can be readily connected at any point, and, as a result, any place along the ditch can have prompt communication with the power house.

The penstocks, two in number, are each 1,165 ft. long. Under a total head of 604 ft. there is an effective head of 600 ft., or working pressure of 260 lb. per square inch. There is one complete independent penstock for each of the two units. Each consists of a line of 36-in. and 28-in., and at the lower end two lines of 18-in., all riveted steel pipe of various gauges according to its position in the line. At the Ys, or points where the single 28-in. pipe branches into two 18-in. lines, the penstocks are enclosed and anchored in a massive block of masonry laid up with imported portland cement mortar. At their lower ends just before entering the power house they are secured by a similar form of construction, and at various points they are held by bands and anchor-bolts leaded and sulphured into the bedrock. Throughout their entire length they are laid in trenches and covered by back filling, except at their lower ends, where the profile of the hill is such that it was best to lay each in a separate tunnel. After completing and testing the penstocks, the tunnels were walled up and back-filled.

The penstocks are each provided with an 18-in. stand-pipe just outside the forebay walls to allow air to enter when the forebay gates are closed, and thus prevent collapse of the pipe. They are also provided with air-valves and man-holes at suitable points.

The pole line extends almost due west from the plant to the sub-station in Eureka. The length is 65 miles. The line is a single circuit; three-phase; averaging 35 poles to the mile. The poles are redwood at the western end; in the inaccessible stretches the native red fir was the only wood available. Insulators are Locke two-piece single petticoat porcelain, 8½ in. diam. In the fog-belt a larger insulator of similar design is used. Pins are sun-dried eucalyptus, oiled, 1½ in. diam. The spread of wires on the standard length spans is 40 in.; wire is No. 4 copper, except on some long spans where stranded cable is used. The length of spans varies from 50 to 1,400 ft., according to the conditions and topography of the country.



Interior of Power House.

DETERMINATION OF COPPER BY ALUMINIUM FOIL.—Two or three small pieces of foil are added to the copper in sulphuric acid solution (1 to 5) and boiled. In about five minutes all the copper is precipitated, and can either by washed off and weighed on a Gooch filter, or dissolved and titrated by cyanide.—G. E. Perkins, *Jour. Amer. Chem. Society.*

Tube Mills versus Pans.

A comparative test was made recently at the Ivanhoe mine, Kalgoorlie, Western Australia, between grinding pans and tube-mills. Two pans were run against one tube, 3 ft. 8in. diameter and 13 ft. 6 in. long. The first trial was on coarse sand, coming from the separators below a 20-stamp battery provided with 15-mesh screen. This product was run alternately, for a day at a time, through the two pans and then through the tube. This was repeated for ten days altogether.

Sand remaining on 83 tons per day:

Screening.	Feed.	Discharge — Two Pans.	Discharge — Tube-Mill
20-mesh screen	8.5 %	0.0	0.0
40-mesh screen	29.22%	0.12	4.93
60-mesh screen	12.75%	5.24	10 16
100-mesh screen	13.30%	29.00	21.23
150-mesh screen	4.19%	9.35	7.95
Slime, or through 150-mesh	32.04%	56.29	55.73

These figures show that the two pans leave 0.12 per cent of sand coarser than 40-mesh, while the tube-mill leaves 4.93 per cent. The sliming here appears the same with both machines.

The second test was on sliming. In the case of the pans the unground sand from the first pan was sent to No. 2 pan, with the return of unground sand from this pan. The unground sand from the discharge of the tube-mill was returned and entered the mill again with the original feed.

Screening Remaining On	Feed. Av. Wt. Per Day, 31.67 Tons.*	Final Product. — Two Pans.	Final Product. — Tube-Mill
20-mesh screen	9.41%	0.0	0.0
40-mesh screen	28.65%	0.0	0.0
60-mesh screen	12.62%	0.0	0.0
100-mesh screen	12.71%	0.0	0.0
150-mesh screen	4.46%	3.25	4.0
Slime, or through 150-mesh	32.15%	96.75	96.0

*(21.49 tons sand).

The bad showing of sand on the 150-mesh is due mainly to the insufficient separation, particularly with the larger returns of sand. In the pan trials the return sand worked up to 87 tons per day. The tube-mill return sand, on its four-days' run, ranged from 84 to 306 tons, according to the different sized nozzles used for feeding the mill.

Mining and Metallurgical Patents.

PATENTS ISSUED DECEMBER 19, 1905.

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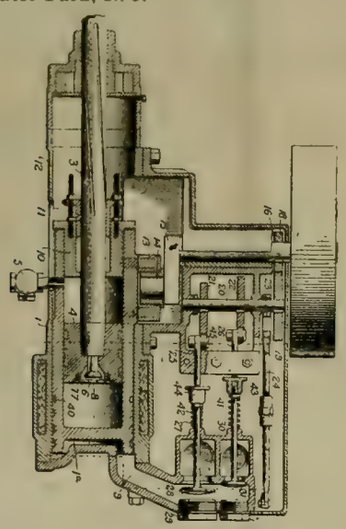
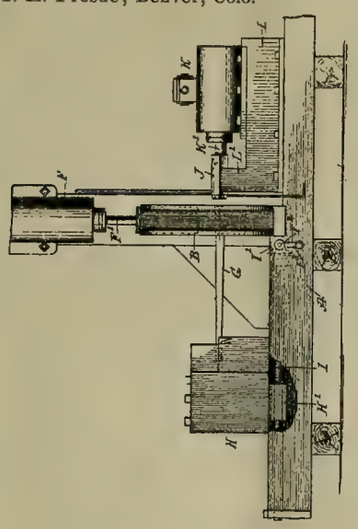
GAS ROCK DRILL.—No. 807,399; J. V. Rice, Jr., Edgewater Park, N. J.



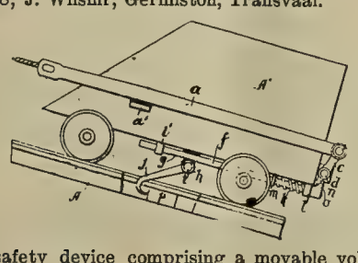
Combination with main cylinder, having at one end explosion chamber, of hollow piston within cylinder, an inner sliding block in piston, air valve arranged in block, piston rod attached to block and provided with longitudinal air passage which is controlled by valve located in block, automatically operating air inlet valve on wall of piston, crosshead on piston, crank shaft, and gas inlet and exhaust outlet valves.

SHARPENING MACHINE FOR DRILL BITS.—No. 807,128; T. H. Proske, Denver, Colo.



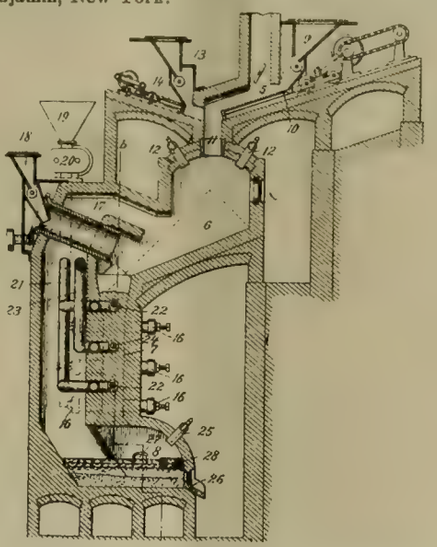
Sharpening machine for drill bits, provided with pair of dies, each having V-shaped recess in working face, recesses registering with each other and tapering from front ends of dies to rear ends thereof, whereby provision is made for holding different-sized drill bits in same recesses of dies with their ends at varying distances from front ends of dies according to size, and dolly having tapering head for entering recesses of dies to upset or sharpen the bits, taper of head of dolly corresponding to taper of recesses and head being of length to enter recesses of dies a distance equal to distance the bit is held within recesses according to size of bit.

SAFETY DEVICE FOR MINE SKIPS AND CAGES.—No. 808,328; J. Wilshir, Germiston, Transvaal.



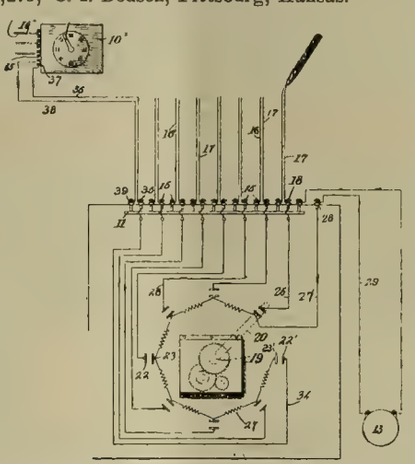
A safety device comprising a movable yoke *a*, a shaft *b*, arms *c* carried thereon, a shaft *d* on which said arms are mounted, a lug *n* on shaft, a spring-actuated bar *f* having a rack formed thereon, a lug *o* thereon engaging lug *n*, a shaft *i* carrying a pinion *h* engaging rack, and a hook *j* mounted on shaft *i*.

METALLURGICAL FURNACE.—No. 808,187; G. H. Benjamin, New York.



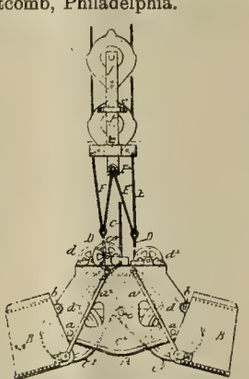
A metallurgical furnace embodying in its construction, a series of arcs, means whereby a reduced ore-body will flow within the zone of action of arcs, and means for introducing a finely divided combining body into ore-body while within the zone of action of arcs.

APPARATUS FOR EXPLODING MINE CHARGES.—No. 808,275; C. I. Dodson, Pittsburg, Kansas.



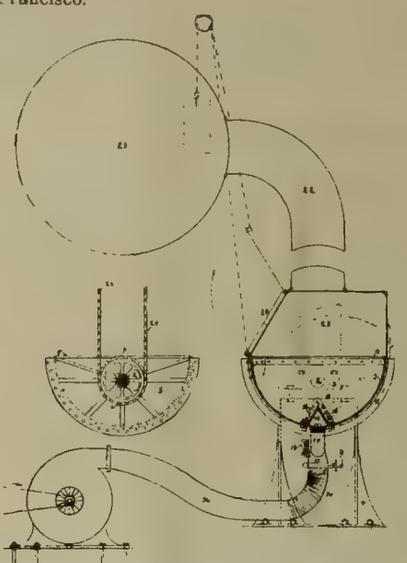
In apparatus for exploding mine charges, a casing, a revoluble arm supported thereby, a circuit-closer carried by arm, a plurality of sets of contacts arranged in an annular series on the casing and adapted to be engaged in successive order by circuit-closer, a source of energy, one pole of which is connected to one of the contacts of each set, a bar supported by the casing and to which the opposite pole is connected, binding-posts arranged in sets, one set connected to the bar and the other set being carried by the casing, current-conductors extending outward from the binding-posts to the charges to be exploded, and conductors extending between the second contacts of each set and the casing carrying binding-posts.

MEANS FOR TURNING HOISTING BUCKETS.—No. 808,493; G. E. Titcomb, Philadelphia.



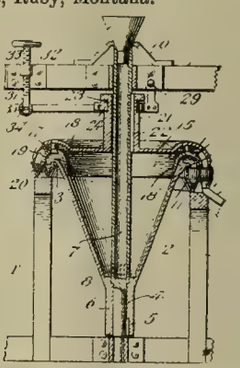
The combination of a hoisting bucket, three sets of ropes leading from the hoisting mechanism to the bucket, one rope being a closing rope and another a holding or opening rope and the third a holding, opening and turning rope, and means connecting the latter rope to the bucket so that when rope is under tension, the bucket will be turned.

PROCESS OF ROASTING ORES.—No. 808,361; H. Haas, San Francisco.



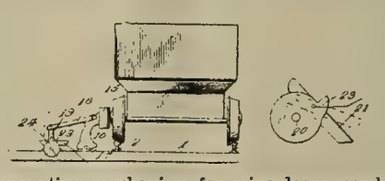
The process of roasting ores which consists of bringing them to the point of ignition, and supplying a light blast of air evenly distributed throughout the whole mass for the purpose of maintaining combustion thereof, and creating a sintered agglomeration, blast being sufficiently light, and being continued for a sufficient time, to drive off and oxidize only the more easily separated molecules of sulphur, or other metalloids, maintaining the heat below the smelting point, and then increasing the blast to separate from the residue the less easily separable molecules of sulphur, continuing to increase the blast as required for the complete separation of the sulphur and then decreasing the blast in proportion to the amount of air decreasingly required to combine with the residual sulphur or other metalloids.

ORE CONCENTRATING APPARATUS. — No. 808,584; X. St. Pierre, Ruby, Montana.



An ore concentrator comprising rotary cone-shaped receptacle having downwardly curved rim, V-shaped concentrate trough surrounding the receptacle and fitting beneath the rim, V-shaped tailings trough surrounding the concentrate trough, hollow shaft extending into the receptacle and being rotatable therewith, cover for the receptacle splined on the shaft and having rim fitting inside the tailings trough, and an annular guide member secured to the cover and having its inner rim fitting into the receptacle and its outer rim formed with a groove fitting over the outer edge of the concentrate trough and the inner edge of the tailings trough.

MINE DOOR.—No. 808,125; A. C. Urban, Buxton, Iowa.



In operating mechanism for mine-doors, combination of a door, means for actuating same, a pressure-bar operable by approaching car, a shaft, an operative connection between shaft and pressure-bar, a door-engaging member mounted on shaft, a detent carried by door-engaging member for engagement with the door, and means permitting operation of the detent independently of the door-engaging member.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

In 1904, for the fifth time, the total value of the mineral products of the United States exceeded $1,000,000,000, according to the summary continued in the volume 'Mineral Resources of the United States, 1904,' which the United States Geological Survey has recently published in bound form. The figures given in the summary of the volume show a continuation of the activity in the mineral industries of the United States noted in 1900, 1901, 1902 and 1903, although the value of the output for 1904 was about 9% less than that for 1903. The exact figures for 1904 were $1,289,047,146, as compared with $1,419,280,617 in 1903, with $1,260,501,898 in 1902, with $1,086,550,871 in 1901, and with $1,063,678,053 in 1900. As heretofore, iron and coal are the most important of mineral products. The value of the iron in 1904 was $233,025,000; the value of the coal, $444,816,288. The fuels decreased from $634,226,291 in 1903 to $584,483,514 in 1904, a loss of $49,742,777, or 7.84%. Anthracite coal showed a decrease in value of $13,062,428, from $152,036,448 in 1903 to $138,974,020 in 1904. The average price of anthracite coal per long ton at the mine was $2.35 as against $2.50 in 1903, $2.35 in 1902, $2.05 in 1901, $1.85 in 1900, and $1.80 in 1899; and the average price per short ton for bituminous coal at the mine was $1.10, as compared with $1.24 in 1903 and with $1.12 in 1902. The decrease in value of the bituminous coal output from 1903 was $45,845,665, a combined decrease in value of coal of $58,908,093 in 1904. The loss of $130,233,471 in the total value of our mineral production is due to losses in both metallic and non-metallic products, the metallic products showing a decrease from $624,318,008 in 1903 to $541,466,796 in 1904, a loss of $82,851,212, and the non-metallic products showing a decrease from $793,962,609 in 1903 to $747,180,350 in 1904, a loss of $46,782,259. To these products should be added estimated unspecified products, including molybdenum, bismuth, tungsten and other mineral products, valued at $400,000 (as against $1,000,000 of unspecified products in 1903), making the total mineral production for 1904 $1,289,047,146. The manufacture of arsenious oxide, noted for the first time in the United States in the report of 1901, was continued in 1904, but again in decreased proportions as compared with 1902 and 1903. Statistics of the production of sand for moulding, building, engines, and furnace use, and for other purposes, were collected for the first time in 1904. Included in the volume for 1904 is a brief report calling attention to peat in the United States and its possibilities as a source of fuel. Tin was produced commercially, though in small quantities, in South Carolina, South Dakota, and Alaska, and the mines were actively exploited during the year 1904.

ALASKA.

The new schedule of commercial rates for the Alaska cable and land telegraph lines went into effect on January 1. The new rates average six per cent lower than the former rates on commercial messages, and there is a small reduction on press dispatches. The Government has also entered into an arrangement with the Alaska Telegraph & Telephone Company, which operates chiefly in the Nome district, by which messages will be forwarded at a special combination rate. According to the new tariff sheet, a message from Seattle to Nome will be charged at 38c. instead of 40c. per word.

Regarding Alaska, the Secretary of the Interior states that the total permanent white population is 26,000, averaging one person for every nine square miles, and has not increased to any appreciable extent during the past year. Transportation at this time to any portion of the district away from the seacoast is difficult. Several lines of railroad, in addition to those already built, have been projected. The Alaska Central, leading from Seward, at the head of Resurrection bay, on Kenai peninsula, has cleared more than 100 miles; about 30 miles of it are in use, and when completed will terminate in the Tanana valley, toward Fairbanks, a distance of 420 miles. It is intended to keep 1,700 employees engaged on road construction during the entire year, as was done last year, owing to the favorable climatic conditions. This road will be of assistance to the goldfield expected to be opened in the Sushitna valley. The Valdez-Yukon Railroad Co., 63-65 Wall street, New York City, and the Copper River & Northwestern Co. of Seattle, Wash., each propose to build a railroad from Valdez to Copper river and beyond, probably to the Tanana and Yukon, and are now engaged in the actual work of construction. The Alaska Short Line has projected and surveyed a road to run from Iliamna, on the west coast of Cook inlet and head of Alaska peninsula, across the Kuskokwim to Anvik, on the Yukon. A great amount of railroad construction has been done on the Seward peninsula, and much more is necessary to meet the requirements of the mining camps of that section. A board of road commissioners composed of army officers was created by the Secretary of War, of which Maj. W. P. Richardson was designated as chief. The board has provided for the location of a wagon road from the head of Chalmondeley sound to Hetta inlet, on Prince of Wales island; for the survey of a road from Haines mission to Hindestucy, on the Chilcat, to Wells, with the survey of a trail from Wells to the boundary near Pleasant camp; for the collection of data for a road yet to be determined from the head of Gastineau channel to a point near the southern extremity of Berners bay; for the work of relocation and improvement of the trail from Valdez to the mouth of the Gokona river, thence by the way of Big Delta to the Tanana, and down that stream to Fairbanks; for such work of improvement as the funds permitted on the roads leading from the terminus of the Tanana Mines railway to Gilmore, to the Summit, and thence to Cleary creek, and from the Summit to Fairbanks creek; for the preliminary reconnoissance and location of a road from Council City to the east fork of the Solomon river; and a road from Nome northward by the way of the head of the Nome river and toward the Kougarok river. New discoveries have been made in the country between Ketchikan and Juneau, the latest discovery being on the west side of Chichagoff Island, 60 miles north of Sitka. A considerable amount of gold has been taken at Cape Yakataga, about 65 miles east of Kayak. The whole area south of the Yukon and north of the sea seems to be gold producing, a great part being unexplored. The output of gold from the mines for the year has been about $10,000,000. Silver has been produced in considerable quantity from the galena ore in the Sheep Creek mines, near Juneau, and large galena deposits, rich in silver, have been discovered at the head of the Fish river, emptying into Golofnin bay in Norton sound. Copper is being extensively mined, a number of such properties being located upon Prince William sound. The shipment of copper sulphide from the Ellamar mine, Virgin bay, 30 miles from Valdez, has been nearly at the rate of 2,000 tons per month. Plans have matured to construct a railroad from tide water at Valdez to the copper mines on the Chitina river, where the ores are very rich and can be mined at a small cost. Their production will be rapidly increased when transportation facilities to the coasts have been established. Tin is also mined with success in the York district of Seward peninsula, one company having a 20-stamp concentrating mill and 700 tons of ore on the dump, with other groups of claims bonded for large sums. Alaska is also rich in coal.

William Stevens of Redding, Cal., reports that the Alaska Perseverance Company, 5 miles from Juneau, is putting up a 100-stamp mill, a portion of the frame-work being in position, and all of the material on the ground.

Hydraulic mining will begin on Cooper Creek, near the lower end of Kenai Lake, as soon as a flume and a dam can be built to control the waters of Cooper Lake. The Kenai Mining Company owns 640 acres extending up Cooper Creek from the place where it empties into Kenai River, 5 miles from Kenai Lake. The gravel in this property has been worked on a small scale and has proven rich.

ARIZONA.

Yavapai County.

The McCabe mine at McCabe and the Model mine, 14 miles south of Kirkland, have been sold to the Ideal Mining & Development Company, owners of the Gladstone mine. It is reported that the McCabe mine is to be equipped with new boilers, pumps and pipes and that sinking is to be resumed in the main shaft.——It is reported that a 375-ton concentrator is to be put in at Copper Creek, 25 miles east of Mayer, to treat ore from the Rosalie claims. O. B. Stanton is interested.——One of the Congress mills is running steadily on gold concentrating ore from the company's Niagara vein, which lies near and parallel to the original Congress lode.——A hoisting plant with capacity for 4,000 ft. has been purchased for the Octave mine, northeast of the Congress.

In the Los Angeles *Times*, J. H. McClintock states that the copper production increase of Arizona has come largely through the operation of the new Copper Queen smelter at Douglas, though the Old Dominion and United Verde furnaces did 10,000,000 lb. each better than in 1904, and the Calumet & Arizona at Douglas advanced 4,000,000 lb. Owing to floods, the production of the Arizona Copper company and of the Detroit Copper company dropped off materially. The Shannon appears to have held its own. The copper bullion product for 1905 will be found practically as follows:

	Pounds.
Copper Queen, Bisbee	60,000,000
Detroit Copper, Morenci	15,000,000
Old Dominion (inc. United Globe) Globe	27,000,000
Moctezuma, Nacozari, Sonora	10,000,000
Imperial, Silver Bell (smelted by Copper Queen)	6,000,000
Calumet and Arizona (inc. Pittsburg and Duluth and Lake Superior and Pittsburg), Bisbee	34,000,000
Arizona Copper, Clifton	31,400,000
Shannon, Clifton	14,000,000
United Verde (inc. Equator), Jerome	40,000,000
Ore shipments to outside smelters	4,000,000
Total for year	241,400,000

The Phelps-Dodge properties (Copper Queen, Detroit, Old Dominion-United Globe and Moctezuma) produced more than 46% of the total. The company's Copper Queen smelter at Douglas is the greatest in the Southwest and is being added to continually. It has equipment for handling 3,000 tons of ore a day, though it is run at only about two-thirds its capacity. The shipped ores noted in the production table have gone to smelters at El Paso and in Colorado from the Clifton district, from Globe, from the Superior mine in Pinal county, from the Dragoon mountains of Cochise county, from mines in Santa Cruz county, from the Bradshaw mountains near Prescott and from the Grand Canyon district. In the estimate also is included matte from a smelter that has been operated somewhat on the northern side of the Grand Canyon.——The Detroit and Arizona Copper companies are doubling their concentrator capacities.——The Shannon lately installed converters, saving transportation of matte to the Arizona Copper company's smelter.——The Globe smelter has been in operation only a part of the year and is capable of 50% greater output.——A concentrating mill and furnace, with initial capacity of 300 tons a day, will be built by the Imperial company at Silver Bell, Pima county, thus trebling its bullion product.——A new furnace was added lately to the Calumet & Arizona smelter at Douglas.——Improvements being made at the United Verde smelter will permit of fully 50,000,000 lb. of copper product in 1906.——At Humboldt, in Big Bug district, south of Prescott, will shortly be blown in a custom smelter, handling, besides silver and gold, about 300 tons of copper ore a day. In the same vicinity the Rigby plant is approaching completion and the Treadwell smelter is showing signs of activity.

Cochise County.

The Emerald, Lucky Cuss, Silver Thread, Tranquility and Tough Nut mines of the Tombstone Consolidated Co. are short of fuel owing to the snow blockades on the coal-carrying railroads of New Mexico and may have to close down temporarily. The Copper Queen smelters at Douglas are also short of fuel.——J. G. Pritchard, of the San Francisco Mining Co., has bought fifty acres of mineral land adjoining the company's mines at Arizpe.——W. H. Hill is putting in at the property of the Arizona Mining & Developing Company's mine, nine miles south of Naco, a 10-stamp concentrating plant.

The Pittsburg & Arizona Co., near Charleston, has started a double-compartment shaft on the Manila mine, and will sink to a depth of 400 feet.

Superintendent Frank E. Sharpe, of the Kelvin Reduction Co., reports that the new leaching plant has been put in operation. The company is using the MacIntosh process. The plant has a capacity of 35 tons daily, but can be increased by the addition of other rolls. Only carbonate ores are now treated by the process, but sulphides can be handled after a thorough roasting, and the company will soon put in a roasting plant.

Graham County.

The Columbus Copper Co. of New York was recently incorporated to develop mining property near Metcalf. Chas. E. Stevens is in charge and has commenced work.

Gila County.

The Troy-Manhattan Copper Mining Co. has bonded 40 claims owned by J. B. Newman adjoining their Manhattan property and extending to the Dripping Springs wash. A large reduction works is planned by a company and it is reported that the branch standard-gauge railroad will be built, either by the Santa Fe company or the Troy-Manhattan people, from a junction with the Phœnix & Eastern up Dripping Springs wash to the Troy-Manhattan company's mines.

The Globe-Boston Mining Co. has disposed of its properties near Globe to H. A. Smith, acting for Duluth and Michigan parties. It is supposed that they will form a new Bonanza Circle property. The mine has a 500-ft. shaft and has been idle for the past year because of lack of funds.

Mohave County.

It is reported that work is to be started up on the Alexander mines, in Paymaster basin, near Kingman, owned by James Dundon.——F. Stull has leased the Lucky Boy mine, near Chloride, and has begun the shipment of ore.——Shaft sinking at the Idaho mine, at Cerbat, is progressing at the rate of about two feet daily. The property is owned by E. F. Thompson of Kingman, who is preparing to make shipments of ore to the Needles smelter.

C. D. Pickering, superintendent of the Yucca Cyanide Mining & Milling Co., reports that as soon as the compressor of the Yucca mine is in place, work on the deep working shaft will be renewed. This shaft will be sunk to the depth of 1,000 ft.——L. M. Teale and James Polsen are preparing to put in a large steam boiler and pump at the J. F. T. mine, near Kingman. Later a hoist will be brought it.——Hoisting plants are being put on the group of mines, controlled by E. S. Osborne, and Osborne & Wardwell on Bill Williams Fork. On the Blanchard-Butler mines, in the same district, hoists will soon be put in, as the shafts are getting below the depth where whims and windlasses can be used to advantage.

The 50-ton smelter plant recently ordered for the Cleopatra mine has arrived at Jerome, and is now being placed. The smelter is expected to be running within a few weeks.——The diamond drill for the Harryhousen group of mines at Jerome is now on the ground, and is being set up.——Four cars of machinery for the United Verde mine at Jerome have arrived.

Yavapai County.

At the Poland mine, at Poland, new track scales have been put on the high line, and are employed in the weighing of all ore for the Poland mill, and the weighing of all freight passing through the Poland tunnel. The mining being done now is principally on the Poland vein and in the development of the Accidental and other ledges that form a part of the Poland group. The mill is running regularly.

CALIFORNIA.

Nearly all the big mines of the Mother Lode have been compelled to suspend operations owing to scarcity of water. The water in the ditch has turned to ice, shutting off supplies of water for the mines. Only enough has been available to keep water down and supply the towns for domestic purposes. The rains of last week have improved the outlook and all the mines are expected to start up in a few days.

The total oil products for 1905 will aggregate 33,000,000 bbl., which will be 10% increase over the output of 1904. The amount of crude oil exported during the year was 800,000 bbl.; the amount of oil in tankage is estimated to be 10,000,000 bbl.; the manufacture of kerosene has consumed 4,000,000 bbl. The quantity utilized in sprinkling roads and the manufacture of lubricating oils and naphtha have not yet been estimated for the year. The railroads of the State are computed to be consuming 15,000,000 bbl. annually, proving that fuel oil discovery in California and the low prices at which it is being procured have proved a greater boon to railroads than any other line of commerce.

Alpine County.

The Hercules claims at Loope have been taken over by the California Alpine Co. Additional men are being placed at work. In a short time the company will begin the construction of its electric power plant.

Amador County.

At the Defender mine, J. H. G. Wolf, who has been operating the property on a lease, has decided to suspend operations until spring, owing to the difficulties incident to cold weather and bad roads from Jackson.

The Zeila mill, near Jackson, has been closed until repairs have been made to the head frame, which have prevented rock-hoisting.

Butte County.

A new dredger mining company is to be organized by W. P. Hammon, E. J. de Sabla and others in San Francisco, with a capital stock of $1,000,000, paid up, to take

over the properties of the late Thos. Crouch and others at Oroville, on which six dredgers are now operated. More dredgers will be built at once.

On January 6th, W. P. Hammon, of Oroville, John Martin, E. De Sabla Jr. and others, of San Francisco, purchased the gold dredgers and dredging lands of the Feather River Exploration Co. and the Cherokee Gold Dredging Co. The sale will not make any changes in the management of the dredging companies.

Calaveras County.

James Hemerich, of Wallace, struck gold on Dec. 31st at a depth of 11 ft. while digging a well. As a result, shafts have been sunk at various places in Wallace, and in a number of instances gold has been found in paying quantities.

In the Yellow Boy mine at Murphys the main shaft is down 270 feet.

El Dorado County.

Work has been resumed at the Havilah mine at Nashville, after a short shut-down.——A drift is being run north to the old Montezuma shaft and one south of the Havilah mill, by contract.

Inyo County.

T. W. Webb has uncovered a six-foot ledge of molybdenum ore, the concentrates from which run $300 to the ton. Mr. Webb and Dr. Croxall, who are interested with him, have located eight claims and are taking out the ore for the purpose of making a test shipment. The claims are in the western arm of Death Valley.

Kern County.

John Singleton, president of the Yellow Aster Mining & Milling Co., owners of the Yellow Aster mine at Randsburg, admits that the mine will probably be sold. W. F. Botsford was given an option on the property and this option has passed into the hands of an English syndicate, which has had the mine examined and is expected to take up the option.

Madera County.

The new owners of the Zulu mine on French Gulch, east of Madera, are preparing to build a road to the mine and put in machinery as soon as the weather will permit.——Wm. Lawrence, superintendent of the Texas Flat mine at Coarse Gold, reports that the mill at the mine is again in operation, sufficient water having been secured to generate power.

Mariposa County.

The Exchequer Gold Mining Co. is building a concrete dam across the Merced river, near its claims, north of Hornitos and east of Merced Falls, to develop electric power to operate its mines. The company has over one mile of locations on a ledge cut by the Merced river.

Mono County.

The shaft at the Weitfle–Eastwood mine at Masonic is to be sunk another 50 ft. and crosscuts will be run from the lowest point.

Nevada County.

Preparations are being made at the Empire mine at Grass Valley to resume operations independent of the water supply. A large motor, formerly used to operate the mill, is being rigged up to run the pumps. Sufficient water can be had to operate the hoist.——The North Star is making arrangements to keep the mine going in the future without regard to water conditions, though it will be equipped to work with either water or electricity. A new 60-cycle motor is on the way and will be used to keep the mill in operation.

At the Central shaft of the North Star Mines Co. men have all returned to work, after a lay-off, owing to lack of water to operate the machinery. The hoist is being operated by steam and the pumps by electricity. ——The Morning Star mine at Badger hill, near Nevada City, is to be re-opened by H. R. Hicks.

The work of pumping out the north shaft of the Banner mine, which was begun last September, has been completed, and Superintendent Kendall is having a sump cut preparatory to beginning sinking the shaft to a depth of 1,200 ft. Drifts will be run on the vein at each 200 ft.——N. B. Sherhard and M. C. Emerson are clearing out an old incline shaft on the Noble place preparatory to developing the mine systematically.

San Bernardino County.

J. W. Green, of San Bernardino, superintendent of the Gold Park Mining Co., owners of fifty-two claims in Riverside and San Bernardino counties, reports that his company will at once sink a 1000-ft. shaft and will install new machinery, some of which is already on the ground. He reports that the improvements for next year will cost between $30,000 and $40,000.——Thirty-one mining claims on which tungsten has been found in paying quantities changed hands on Jan. 5th, when papers were filed at San Bernardino. The claims are in the St. Elmo district, in the extreme northwest corner of the county. The purchasers are Edward B. Degolia and Ernest M. Atkins of San Francisco. Development work is to be commenced.

San Diego County.

The 100-ton plant of the Julian Reduction Co. at Julian has been started.

In a cave-in at the High Peak mine at Julian, Sidney Pettitt, a miner, was killed and W. W. Boswell, the superintendent, was fatally injured.

Shasta County.

In the suit to quiet title to the Shasta mine, formerly known as the Wiser mine, in the Lower Springs district, against the Gem Consolidated Mining Co. and William P. Miller, Judge Head of Shasta county has given judgment in favor of Mr. Wiser. The judgment quiets title and assesses the cost to the defendant company. The Wiser mine comprises seven claims, a mill and machinery, and for many years has been worked by Henry Miller. Prior to his possession, it was operated by Mr. Miller and the Gem company. Recently Mr. Wiser disposed of the property to the Shasta Mining Co., composed of Gus Hurst, D. McCarthy, James Holt, Robert Martin and W. M. Gunton.

George T. Graves, Charles S. Graves and Charles Avery have deeded a one-fourth interest in the Backbone group of copper mines, consisting of twenty claims, to Joseph A. Kahny.

The Great Western Co. is pushing the main tunnel in its mine at Ingot, from the main works to the Donkey mine. When this tunnel is completed it will have a length of 4,500 ft.——The Sugar Loaf copper claims on Spring creek, owned by Fillius, Grotefend, Galvin and King, have been temporarily transferred to Jacob Fillius of Denver, the transfer being a step toward incorporation under Colorado laws. Extensive development work will be commenced this spring.

Sierra County.

At the South Fork gravel mine, near Forest City, there are 13 men employed under the superintendency of F. W. Kuhfeld. In the east drift the gravel is coming down into the tunnel and prospects well. All preparations are now made for breasting as soon as water arrives so that the gravel can be washed.——The Sierra Buttes mine, Sierra City, has 100 men at work. The two mills are now steadily crushing rock. W. D. Pinkston is superintendent.—— At the Telegraph and White Bear mines work is being done by reduced crews on account of the low stage of water.——Work has been stopped at the Wisconsin and Rainbow mines, near Alleghany, because of lack of water.

The Comet quartz mine in Jim Crow canyon, seven miles from Downieville, has been bonded to T. K. Code, who will commence work at once.

Siskiyou County.

It is reported that work is to be resumed by the Blue Ledge Copper Co., at the head of Joe creek, four miles south of the Oregon line. J. R. Allen is president. The mines may be reached from Callahan.

Following the purchase by the California Consolidated Mining Co. of the rights of Stephens Bros., in the disputed mining property in the Liberty district, it is announced that a new tunnel will be started immediately to connect the Stephens claim with the Mountain Laurel mine. As soon as this is completed, stoping and milling will be commenced.

W. T. Cope of Grants Pass, Or., has purchased from Mr. Page the lease of the Blue Gravel mine and water rights in the Greenhorn district, two miles from Yreka. This mine, which is owned by H. E. Strassler, has been tied up for some time by liens filed on account of work performed and material furnished. It is a bedrock drifting proposition, and has a shaft 116 ft. deep. Mr. Cope has satisfied the holders of the lien, and will put in pumps and a hoist.——W. A Chamberlain, owner of the Black Lead mine, adjoining the Blue Gravel, which is a deep gravel, drifting proposition, has 10 men at work.——Tethrow, Butler & O'Neill, owners of the Highland mine, have received $29,456.15 as net returns from 1,900 lb. of ore recently shipped to the Selby smelter from the Highland mine.

Trinity County.

Robert Hicks has six men at work at the Hunter mine at New River.——J. H. Byers has eight men at work at the Mountain Boomer, near New River. The mill has been shut down because of the scarcity of water.

Equipping the Paulsen mine at Douglas will be begun in the spring by the new owners.

Superintendent J. A. Brent of the Quimby Gold Mining Co. has made his first clean-up at the company's mill on Quimby creek. The clean-up is valued at $3,800. The company is working at a depth of 275 ft. The company has equipped a modern 9-stamp quadruple-discharge mill. The power is furnished by three turbine water wheels. The mill was started on Nov. 17.

COLORADO.

Following is the product of the Colorado plants of the American Smelting & Refining Co. during 1905, namely, the Globe, Pueblo, Eilers, Philadelphia, Arkansas Valley and Durango:

	Net Lb.	GOLD. Oz.	GOLD. Value.	SILVER. Oz.	SILVER. Value.	LEAD. Lb.	LEAD. Value.	COPPER. Lb.	COPPER. Value.	Total.
Colorado	1,748,045,317	463,170	$9,573,724	11,399,763	$6,896,857	99,927,304	$4,697,053	8,920,964	$1,382,750	$22,550,384
Arizona	90,803	185	3,824	4,020	2,452	3,080	145	388	60	6,461
California	216,603	225	4,651	59	36	599	28	504	78	4,793
Idaho	194,015,781	185	3,824	3,152,127	1,907,037	101,002,165	4,747,101	418,530	64,872	6,722,834
Montana	125,033	4	82	3,923	2,379	7,901	371			2,832
Nevada	3,024,230	14,569	301,141	33,917	20,520	79 040	3,715	3,251	504	325,880
New Mexico	52,078	15	310	1,700	1,028	9,070	426	9,986	1,548	3,312
South Dakota	2,831,912	2,516	52,006	10,069	6,092	4,816	226	3		58,324
Utah	6,268,680	460	9,302	68,936	41,706	1,478,639	69,496	105,407	16,338	136,842
Wyoming	2,665,761			205	124					124
British Columbia	4,046,868	76	1,571	135,663	82,076	93,526	4,396			89,043
Central America	13,635	29	599	6,306	3,815	500	24			4,438
Mexico	3,250,461	16	330	14,024	8,485	681,973	32,053			40,868
Totals	1,964,647,162	481,440	$9,951,364	14,830,722	$8,972,587	203,298,613	$9,555,034	9,459,033	$1,466,150	$29,945,135

The reports of Colorado metallurgical plants for 1905 show the following results on ore treated:

Name of Plant.	Process.	Gold.	Silver.	Lead.	Copper.	Zinc.	Total.
American S. & R. Co. smelters	Lead basis smelting	$ 9,951,364	$ 8,972,587	$ 9,555,034	$1,466,150	$	$29,945,135
Ohio-Colorado, Salida	Lead basis smelting	287,760	459,795	602,446	45,203		1,395,204
United States Reduction Co.	Chlorination and smelting	7,555,000	181,500	272,600	186,000	802,500	8,997,600
Portland, Colorado City	Chlorination	2,228,000					2,228,000
Economic, Cripple Creek	Chlorination	1,832,900					1,832,900
Dorcas, Florence	Chlorination-cyanide	1,029,150					1,029,150
Anaconda, Cripple Creek	Cyanide	133,530					133,530
Wild Horse, Cripple Creek	Cyanide	118,785					118,785
Homestake, Cripple Creek	Cyanide	85,400					85,400
Santa Rita, Cripple Creek	Cyanide	19,195					19,195
Sioux Falls, Cripple Creek	Cyanide	12,200					12,200
Los Angeles, Cripple Creek	Cyanide	7,575					7,575
Micharado, Cripple Creek	Cyanide	4,080					4,080
Boston-Colorado, Argo	Copper basis smelter	1,264,632	229,911		521,420		2,015,963
United States Zinc Co., Pueblo	Zinc basis smelter					1,186,258	1,186,258
Iron-Silver, Denver	Concentration			658,692		735,425	1,394,117
Empire Zinc, Canon City	Concentration	240,000	267,000	375,000		2,160,000	3,042,000
Totals		$24,769,271	$10,110,793	$11,463,772	$2,218,773	$4,084,183	$52,646,791

To facilitate handling 20,000 tons of manganese ore, a tunnel is being run from the Penrose to the Gray Eagle

(Special Correspondence).—The assassination of ex-Governor Steunenberg of Idaho has stirred up the officials of this State and requisition papers have been issued for the man arrested in Idaho under suspicion for the murder of Steunenberg. It is asserted that he is the man who knows something concerning the blowing up of the depot at Independence, Colo., where several non-union miners lost their lives during the strike in the Cripple Creek district. Reports are to the effect that if he is released in Idaho he will be brought to Teller county for trial.——During the year several new railroad enterprises will probably be added to the list of railroads in the State. Several electric lines are being projected. It is reported that the Moffat road entering Gore canyon is again in trouble over the right of way, but it is believed all objections will be overcome without difficulty. ——The United States Mint at this point is lacking one machine which interferes with the coinage at this time, but it is expected to be in position and running by the 20th of this month, and not later than Feb. 1.

Denver, Jan. 8.

Boulder County.

The Red Lion, near Ward, is to resume operations soon. A cyanide mill in connection with amalgamation will be put in the mill.

The Keystone Mining & Development Co. is to resume work at the Dirigo tunnel, near Sugar Loaf, to open up the newly opened-up vein. The tunnel is in 2000 ft. and will be continued 500 ft. further.

Chaffee County.

The mineral production of Chaffee county exceeds that of previous years, and most important discoveries have been made, notably the molybdenum strike on Chalk creek by H. C. Hayes; the Texas gold on the head of Cottonwood creek by I. N. Williams. The Latchaw Tunnel Company, now in Mt. Princeton nearly 3,000 ft., made its initial shipment during the past year.

Clear Creek County.

G. B. Sinclair, of Denver, has commenced work on his claims adjoining the Red Elephant mine, lying on Red Elephant mountain, near Empire.——Benjamin J. Hatmaker of Buffalo, N. Y., is expected in to open up the Coolie mine near Empire.

Fremont County.

An attempt made January 10th to fire the zinc smelter at Canyon City, a $2,000,000 plant, makes the fifteenth attempt at incendiarism in Canyon City in the past two weeks.

Lake County.

The following figures of Leadville's mine tonnage were furnished the *Herald Democrat* by the managers of the various properties:

Name of Mine	Oxidized Iron	Carbonate	Sulphide	Zinc	Siliceous
Western Mining Co.	20,490	1,870	29,350	24,050*	
A. Y. and Minnie			63,466	15,000*	
Midas	30,130	10,104			100,140
Iron Silver Mining Co.	1,700	6,400	43,000	99,800	
Small Hopes	750		363	1,507	15,880
Boreel			150	7,590	
Reindeer		30,000			
Morning Star	40,000				
Evening Star	1,600				
Catalpa	4,000				
New Monarch Mining Co.		10,000	30,000		
Ibex Mining Co.			28,230	1,890	24,000
Yak M., M. & T. Co.			60,000	10,000	
Benton	1,200				
Lillian		300			
Resurrection			5,000		
Ollie Reid			600		
Fryer Hill Mines	10,000				
Fortune			3,750		3,750
Manganese	6,000				
Miscellaneous	17,300	27,500	34,000		10,600
Totals	127,170	86,174	297,909	159,747	154,730

*Concentrates.

Leadville's metal production for 1905 was:

Product	Ounces or Pounds		Market Value	Total Value
Gold	60,205	406 oz.	$20.67	$1,244,446
Silver	5,040,949.09	"	.6035	3,042,213
Lead	55,073,739	lb.	.0475	2,616,002
Copper	5,631,629	"	.156	878,974
Spelter	92,809,800	"	.0575	5,336,563
Maganese	6,000	tons	8.00	48,000
Total				$13,164,198

been put in and a shaft sunk 135 ft. and still going down.

Mineral County.

During 1905 there were 65,000 tons of ore and concentrates shipped from Creede. Two mills in operation produced 8,800 tons of zinc concentrates, averaging 40%. Several trial runs with the newly completed Amethyst mill have proved satisfactory. Dewey Bros. will start the Ridge mill on ore from the mine that they are operating under lease.——The Commodore mine, at Creede, is to be worked by leasers.

Pitkin County.

The American Smelting & Refining Company's figures for the output of Pitkin county for 1905 is as follows:

	Oz.	Value.
Gold	170.00	$ 3,523
Silver	2,320,697.71	1,404,022
	Lb.	Value.
Lead	20,056,019	$ 970,832
Copper	132,768	20,579
Total values		$2,398,956

The output of the county in 1904 was: Gold, 40 oz.; silver, 2,038,181 oz.; lead, 18,882,401 lb.; copper, 9,562 lb. The increase in silver, lead and copper is largely attributable to the high prices that have prevailed, which have caused the opening of old properties and the addition of men in working properties.

San Juan County.

The Silverton *Standard* gives the foliowing summary of tram lines in San Juan county: Iowa Gold Mining & Milling Co., 16,600 ft.; Sunnyside, 16,000 ft.; Silver Lake, 14,700 ft.; Silver Lake Unity Tunnel, 6,000 ft.; Silver Lake from Midway to Mill, 2,000 ft.; Gold King, 3,300 ft.; Silver Ledge, 4,000 ft.; Old Hundred (Howell Hines, Cunningham Gulch) 4,000 ft.; Royal Mining Co., 1,000 ft,; Thunder Tunnel, 1,500 ft.; Contention, 5,300 ft.; Henrietta, 5,460 ft.; Grand Mogul (built this year), 8,500 ft.; Champion (built this year), 1,500 ft.; Hamlet (built this year), 2,000 ft. Statistics of number of men employed show: Silver Lake mill and mine, 350; Gold King mill and mine, 175; Sunnyside mill and mine, 100; Hamlet mill and mine, 50; Champion mine, 65; Ruby mill and mine, 35; Natalie mine, 20; Pittsburg Metal Mining Co. mine, 20; Astor Mine mill and mine, 30; Bull lion King mine, 10; North Star lessees (Solomon) mine, 15; Highland Mary mine, 20; Shenandoah-Dives mine, 25; Green Mountain mill and mine, 80; Silver Ledge mill and mine, summer months, 140; Hercules mill and mine, 75; Old Hundred mill and mine, 110; Mogul mill nd mine, 115; Frisco Tunnel Co., 12.

The output of San Juan county, according to the Denver *Post*, including crude ore and concentrates, partly zinc, during 1905, amounted to 84,065 tons, having a gross value of $3,626,335, which, compared with the yield of 1904, as reported by the United States Mint—$3,572,-119—shows an increase of $54,216. The Gold King, which is accorded first place, produced from its mill 35,000 tons of concentrates; average value, $35 per ton. The Silver Lake mill gave out 16,000 tons, averaging $32.50. The Sunny Side, which amalgamates 77% of the gold contents of its ores, produced 3,813 tons, valued at $20 per ton. The Ross-Champion shipped 1,925 tons of crude, averaging $33 per ton. The Old Hundred mill of 200 tons capacity will be completed by March 1; that of the Green Mountain Company about the middle of February, and the Grand Mogul, with its connecting tramway, on or before April 1. So many hindrances have befallen the operations of contractors engaged in building the Gold Prince 500-ton mill, principally severe weather and blocked or congested railways, it is impossible to fix the date of its completion. The Kendrick-Gilder smelter, above Silverton, under lease to the Ross Mining Company, will produce copper matte from its own properties and from custom ores. Plans are formed to keep the establishment running throughout the year. The Animas Power Company will be supplying electric current to all the larger properties in San Juan county this month from its sub-station near the Silver Ledge mill. The *Standard* reports that the Denver & Rio Grande Railway increased its freight traffic on the line between Durango and Silverton 33% last year. It is said that the company will standard-gauge this line during the year. The Silverton Railroad, with a terminal at the town of Red Mountain, handled during the six months it was open, 6,200 tons of ore and concentrates and 15,000 tons of freight, principally coal and lumber for the mines on the Ouray side of the range. Next spring the line will be extended to Ironton, to accommodate the Crawford Syndicate mines, the Treasure tunnel, the Barstow, Silver Ledge and Ruby basin. The Silverton, Gladstone & Northerly, built by the owners of the Gold King mine, carried for other operators along its line 10,000 tons, and an equal tonnage for the Gold King. Concentrates and a few cars of crude ore made up a total down freight of 35,500 tons. The Silverton Northern, another feeder of the Denver & Rio Grande, carried 132,000 tons, principally to Eureka, where 40,300 tons of concentrates and crude ore were shipped down. The Silver Lake mine, owned by the Guggenheim Exploration Company, suffered a loss of $370,000 in output by the fire which destroyed the midway terminal of its tram line. The yield of the mines for 1905 was 70,000 tons of crude which was reduced to concentrates. The outlook for this year is the most encouraging that has ever been known in San Juan county. When spring opens all the big mills partly constructed in 1905 will be in operation.

San Miguel County.

The Yellow Aster group, near Ophir, has been leased to Telluride people by Frank Maumey, of Telluride.——John P. and John B. Olson are getting the Columbia-Mencna mines, in Savage basin, five miles east of Telluride, in condition for a steady production.

The San Miguel *Examiner* gives the following as the mineral production of San Miguel county for 1905: Tomboy, $820,000; Smuggler-Union, $700,000; Liberty Bell, $400,000; Keystone Placer, $300,000; Alta, $250,000; Butterfly-Terrible, $170,000; Carribeau, $75,000; Carbornero, $65,000; Suffolk, $25,000; Ophir Consolidated, $20,000; Little Mary, $15,000; Mammoth, $10,000; Morning Star, $10,000: Pick-Sessions, $10,000; Saw Pit District, $40,000; Adams, $10,000; miscellaneous, $150,000; total, $3,070,000.——The Liberty Bell Gold Mining Co. has an 80-stamp mill, with cyanide and rag plant. Crushing is done in cyanide solution. The cyanide plant was remodeled the first of the year and three new tube mills put in for re-grinding the pulp. The Stilwell tunnel started by the company three years ago cut the vein in July, 800 ft. under the present workings. Some drifting has been done on the vein and last month an upraise was started to connect with the present workings.——The Tomboy Gold Mines Co., Ltd., has a new 80-stamp mill.——The New Tomboy on the Argentine and Red Cloud claims is worked through the Cincinatti shaft, which is 1,300 ft. deep. David Herron is manager.——The Old Tomboy has been worked in a small way by leasers.——The Smuggler-Union has been operated entirely by leasers during the year. For the first eight months the principal lease was held by Lindsley & King and their product was milled by the company at the new mill. Their lease expired in September and the major portion of the mine, together with the new mill, was then leased to Robeson & Carter, who employ 250 men. The old or Pandora mill, owned by the company, has been running ore from the small leasers, of which Wagner Bros. are the principal, Lindsley, King & Townsend, the Goldfield-Rex Mining Co., the Pandora Gold Mining & Development Co. and others. In July the Pennsylvania tunnel at a depth of 2,600 ft. cut the Smuggler vein 700 ft. under the old workings.——The Japan-Flora Mines Co. has closed down for the winter. T. Walter Beam, the manager, states that arrangements are making for active operations in the spring.——The Cimerron mine and mill have been under lease to Wagner Bros.——The Little Mary mine and 10-stamp mill have been run by local leasers.——The State road to the top of the range through Bridal Veil basin has been completed and much work has been done in the way of development on the properties of the district.——The Mayflower Mining & Milling Co. added four new claims and two new mill sites to their holdings by location.——The Allegheny mill, above Telluride, is to be remodeled. An aerial tramway, with a fall of 3,000 ft. to the mile from the upper to the lower terminal, has been surveyed 2¾ miles to the mine. Leron Henry, local manager, states that work will begin early in the spring.——The Double Eagle Mine & Milling Co., owned by Kansas City parties, cut their vein in the Atlanta tunnel, which has been driving for the past three years, 1,900 ft. from the portal. Drifting on the vein is in progress, and an upraise to the upper workings 250 ft. above will soon be started. This tunnel is driving on the Lewis vein, and it is the intention to push it 3,000 ft. further to connect with the Gold Cable group on the west and the Little Dorrit and Lewis group on the north. J. H. Litchfield is manager.——The Royal, under bond and lease to Eastern parties, has been doing development work.——The Black Bear, in Ingram basin, has recently made a strike of rich ore. A shaft 150 ft. deep has been sunk from the tunnel level. In the spring a hoist, an air compressor and drills will be put in.——The Alta, in Gold King basin, has been operated by the Alta Leasing Co. J. L. Brown is manager.——The San Miguel Consolidated mill, on Bear creek, near Telluride, has run a greater part of the summer on ore from various mines in the neighborhood.——The Adams Gold Mining Co. have been running the Thomas mill.——The Keystone placer, 1½ mile below Telluride, washed the entire season, closing down for the winter the 1st of November.——The Vanadium Alloys Co., of New York, is building an experimental mill of 30 tons daily capacity at Newmire. Wm. T. Rynard. of Chicago, is superintendent.——A small 5-stamp mill is being built at Sawpit for the treatment of the low-grade ores of that district.——The Gold Development Co. of Utah, last year, obtained through E. L. Davis, of Telluride, an option on the Silver Pick and Special Session at Mt. Wilson and started an active campaign. The mine was cleaned out and considerable development work done. The mill was started running on the dump, but the death of Dr. Franklin, manager, in September, caused a shut-down until spring.——In the Ophir district the Butterfly-Terrible was let to leasers early in the spring until the company can put through a tunnel which will open up new orebodies at greater depth. The leasers have operated 16 stamps of the mill.——The Silver Bell, owned by the Ophir Consolidated Mines Co., has been idle the greater part of the year. The ore is refractory, carrying tungsten and gray copper.——The Carribeau-Montezuma has produced regularly, with a small force.——The Suffolk has been worked by a number of small leasers.——The Carbornero has made regular shipments to the smelter at Salida, under the management of Geo. R. Pickett. The Tidal Wave, another property under the same manager, has done a great deal of development work.

Summit County.

(Special Correspondence).—The Germania mine on Little mountain, near Breckenridge, is shipping high-grade silver-lead ore from that portion leased by Engle & Kaiser.——The Sallie Barber on Nigger hill, near Breckenridge, is making large shipments of lead and zinc ores.——The Little Sallie Barber, being developed by County Commissioner Phillips, has made a two-car-load shipment of high-grade zinc ore.——The Chester property in Summit gulch, operated by C. C. Acton, has a ledge opened up by shaft.——The Jesse mine is temporarily closed, awaiting renewal of lease.——The Lucky mine on Mineral hill will have its main shaft deepened 100 feet and new levels opened up on the high-grade shipping lead ores.——The French Creek tunnel into the foot of Mt. Baldy is now in 1,850 ft. and a new zinc ledge has been cut through.

Breckenridge, Jan. 6.

Teller County.

The surface equipment of the Golden Cycle and Theresa properties, near Cripple Creek, is to undergo an overhauling. It was recently announced that the Cycle shaft would be continued to the 1,200-ft. point and the Theresa to the 1,000-ft. point, additions of 200 and 300 ft. respectively. Another hoist is to be added and the ore-house is to be enlarged. Automatic conveyors are to be put in between the shaft, ore-house and dump.——Lease of the Zoe mine, on Beacon hill, has been obtained by Tudor, Ashmore and Colorado Springs associates, for 18 months at 25 per cent royalty. They propose to add 100 ft. to the shaft, which will provide a depth of 775 ft.——That part of the Old Gold mine on Beacon hill, lying above the water level at 400 ft. depth, has been leased by James Brunington and associates for 18 months. They have put men to work. The machinery will not be used at present.

At Cripple Creek the Independence Consolidated and the Vindicator mining companies have been consolidated, the Vindicator appearing as the purchaser of the Independence.——The annual report of the Jo Dandy mine shows that during 1905 there was shipped 12,283 tons of ore, which, after moisture charges were deducted, left 11,838 dry tons, having a net value of $151,728.41. The operating expenses were $76,432.25. The average value of the ore per ton shipped from the mine during the year was $21.06 per ton, while the ore recovered from the dump for the year averaged $11.06.

IDAHO.

Idaho County.

Albert Roberts has resumed work on the Buster mine, near Elk City.——The Asotin property, at the mouth of the Red river, six miles from Elk City, owned by E. E. Espey, is being developed.——Andrew Rader is putting in a new type of gas engine at the Syndicate mine, near Elk City.

Shoshone County.

Actual figures showing the output of the Cœur d'Alene district for the year 1905 are not yet available, but the Idaho *Press* has gathered an estimate of the tonnage as follows: Snow Storm (copper), 96,000 tons; Bunker Hill & Sullivan, 91,000 tons; Federal (Burke, Mace and Wardner mines), 68,000 tons; Morning, 31,000 tons; Hecla, 16,000 tons; Hercules, 14,400 tons; Hunter, 1,200 tons; Stewart, 1,200 tons; Frisco, 500 tons; North Side mines, etc., 700 tons; total, 320,000 tons. The Snow Storm shipped crude ore to the smelter and its estimated value is $10 per ton, making a total value of copper ore shipment for the year of $960,000. Deducting the copper shipments from the total leaves 224,000 tons of lead-silver ore shipped during the year. In 1904 the gross value of the product was placed at $57 per ton, but it should be given a higher value for 1905, because during most of the year lead was much higher than in 1904, while silver advanced also. In view of these facts, $60 per ton is a fair valuation to place on the lead-silver ore, making the total value for the year $13,440,000. Add to this value the copper ore, and the gross value of the output of the Cœur d'Alene district for 1905 is $14,400,000.

MICHIGAN.

Keweenaw County.

(Special Correspondence).—The Calumet & Hecla is sinking a shaft on the old Delaware property, now known as the Manitou. The shaft is in the Montreal River lode, and remains rich, but the company has adopted new rules, by which access to the shaft can be had by authorized parties only.——In the spring the Keweenaw Copper Company will start exploratory work in search of the easterly continuation of the same lode, on the newly acquired Resolute tract.——The Tamarack will continue exploratory work on the Cliff lands. Work on the Cliff during the past season has been done with diamond drills.——At the Miskwabik work has been suspended indefinitely.——The Tecumseh and Rhode Island are continuing exploratory work on an amygdaloid, supposed to be the southerly continuation of the Kearsarge lode.——The Arcadian is sinking a shaft on a newly found amygdaloid, toward the eastern sandstone.——To the south of Portage Lake, the Isle Royale is prospecting for the Baltic lode extension on section 12.——The Superior Copper Company has completed its new power plant, and has resumed sinking. Drifting has been stopped during sinking.——The Section 16 tract of the Atlantic is being prospected for the Baltic lode.——On the Globe tract the new drop-shaft is still sinking through the overburden of sand and boulders.——The Challenge property of St. Mary's Mineral Land Company is being developed under the management of L. L. Hubbard, who opened the Champion mine.——The options of the Erie-Ontario Development Company have been extended to the close of the present year, and development work is being continued.——The King Philip Copper Co. has property near the Winona, on which it is hoped to make a mine.——The Lake Copper Company has an option on the Belt mines.

Houghton, Jan. 8.

MISSOURI.

Jasper County.

During 1905, from the Joplin district there was a total shipment of 252,435 tons of zinc and 31,678 tons of lead, the combined value of the two ores aggregating $13,302,-800. The highest zinc price during the year was paid the last week of January and the first week of February —$60 per ton. The lowest price was paid the second week in June—$43 per ton. The average price during the year was $44.88. Lead reached $80 per ton. The lowest price for lead was $57 per ton, paid in February, March and June. The average price for the year was $62.12 per ton.

NEVADA.

Esmeralda County.

The Deadwood-Nevada Gold Mining Co. is perfecting arrangements for a mill on its claims in the Palmetto mountains, 17 miles south of Silver Peak.

The Booth Gold Mining & Milling Co., of Goldfield, will commence sinking a 200-ft. shaft on the south end line. An electric hoist has been ordered.

Owing to the extremely cold weather, resulting in frozen pipes, the Combination, New Western and the Gardner mills were closed down last week.

A Pittsburg syndicate, at the head of which is Charles M. Schwab, has closed a deal for the Blair gold mines at Silver Peak. The price paid is said to be $750,000.

J. S. Cain has opened up good ore in the drain tunnel being driven on the Prospectus mine at Aurora, 30 miles

from Hawthorne.——The Douglas copper mines, near Hawthorne, have been bonded to Thomas Campbell, who will put in a gasoline hoist and air compressor and sink to the water level.

Lincoln County.

(Special Correspondence).—The year of 1905 opened with a single dividend-paying mine in the Searchlight district, the Quartette. Jan. 1, 1906, has added another, the Duplex, to the list. Jan. 1, 1907, should see nine dividend payers, the new comers comprising the Cyrus Noble, the Searchlight Mining & Milling Co., as soon as their new mills go into commission; the Southern Nevada and New Era mining companies, both of which have opened new ore bodies; and the Searchlight Parallel, the Pompeii, and the Santa Fe mining companies, all of which have ore bodies blocked out, water developed, and should be milling before the end of the year. The Good Hope, Goodenough, Hidden Treasure, New Year's Gift Fraction, Commonwealth and Black Hawk mines have opened ore bodies which are in course of development; the Boulder Mining Co. and the Big Six are sinking to crosscut their ledges at depth. Early development is promised on the Saturn and Searchlight Bonanza mining companies, and on the Navajo, Eddy, Ophir, Minnehaha and Enid groups, and the Octopus and Wandering Boy claims.——At Eldorado canyon the Techaticup, Eldorado, Rand and Venus have opened high-grade ore, and mills are promised for the first three within the year.——At Dupont, the Sazerac mine, owned by the Gold Coin Mining Co., has opened ore at 200 ft. depth, and will sink to the 800-ft. level. The Golden Terra is sinking a 500-ft. shaft; the Searchlight Copper-Gold will sink to the 300-ft. level; the Iyanough has four feet of milling ore with spots of high grade at 150 ft. depth; and the Dupont mine, a tunneling proposition, has opened an ore-shoot of high copper, gold and silver values at the intersection of two veins. —— At Juniper canyon, the Juniper mine is being developed, while the 3-stamp mill is turning out bullion. At the Chiquita mine a 500-ft. working shaft is being sunk on four feet of milling ore. A 10-stamp mill is among the improvements contemplated.——At Knob Hill the Silver Legion mine is undergoing development.

Searchlight, Jan. 2.

A working shaft has been started to go to 200 ft. on the Black Bear group belonging to the Searchlight-Bonanza Mining & Milling Co., of Searchlight. J. E. Depue is president of the company, and H. A. Perkins, vice-president and manager.

J. Y. Mekane has acquired the Potosi lead mine, together with properties near Pioche, for Charles Schwab, who will establish a smelter at Las Vegas, Nev. The ores are separated at the mine and sent down different chutes to an aerial tram, which in turn carries them to a roasting plant. After treatment they will hereafter be concentrated and hauled 22 miles over the old Mormon road, which is down grade except for two miles, to Arden Station, on the Salt Lake route, thence by rail to Las Vegas.

The new hoist in the Bamberger-DeLamar mine, at DeLamar, has been completed and the mill is running to its full capacity.

John Brockman has bought the Duplex and Good Hope mines at Searchlight from G. F. Colton. A three-compartment shaft is to be sunk between the Duplex and Gift veins.

Nye County.

The shaft at the Mayflower mine at Crystal Springs is now down 70 ft. It has been thoroughly timbered and sinking is still in progress. The ledge is widening. It is the intention of the company to order a 25-h. p. gasoline hoist to be used after a depth of 100 ft. is attained.

Judge Breen has filed at Tonopah a decision in favor of E. A. Montgomery against P. E. O'Brien and L. S. Finnegan in the grubstake suit, involving the Montgomery-Shoshone mine at Beatty. The case is reviewed at length and a decision rendered which defines the limits and rights of parties to grubstake contracts, settles many cases pending, and will prevent questionable litigation in future. It confirms the title of Bob Montgomery in the Montgomery-Shoshone mine. It releases from injunction 230 tons of high-grade ore worth $300 per ton, which will now be shipped to Salt Lake smelters, and O'Brien & Finnegan must pay the Montgomery-Shoshone $10,000 (amount of the bond) for damages caused by the injunction which prevented ore shipments. The Montgomery-Shoshone Mines Co. will extend the shaft to 400 ft. on the Shoshone and 300 ft. on the Polaris. They will build a mill of 150 stamps, near Beatty, and construct a tramway to it.

J. R. Masterson, superintendent of the Ohio-Tonopah Mining Co.'s property at Tonopah, is putting in an electric hoist and is arranging to have the company's mill operated by electricity.

NEW MEXICO.

Grant County.

The Last Chance mine at Pyramid has been sold to the Aurora Mines Co. of Aurora, Ill., who will work it under the direction of W. S. Bradley.

Otero County.

The Southwestern Mining Co. is putting in a pipe-line 25 miles from the headwaters of the Sacramento river, in the Sacramento mountains, to Jarilla.

At Highrolls, near Alamogordo, a good lithographing stone is being mined.——In Caballero canyon, near Alamogordo, a deposit of brown commercial onyx has been discovered.

San Miguel County.

The Pecos River Mining Co. is to increase its force and start its mill. For a year past the mines have been under development.

Santa Fe County.

The fire at the coal mines of the Colorado Fuel & Iron Co. at Madrid is, for the time being, beyond control and the mine has been abandoned. The miners formerly employed there have been distributed among the company's other properties.

Socorro County.

The Palomas Chief Mining Co. has uncovered high-grade silver ore in the main tunnel of the mine at Hermosa. The tunnel cut the ore 200 ft. below the old workings and 900 ft. from the tunnel entrance.

OREGON.

Curry County

The Rogue River Copper Milling & Smelting Co., with offices at Roseburg, has been incorporated. The company has bonded claims on Rogue River, in Curry county, and will commence development work.

Jackson County.

Electric power has been put in at the Homestake mine near Woodville. The electric current is to be supplied by the Condor company by a branch line from the Gold Ray-Grants Pass main line.

Josephine County.

A. C. Hoofer states that at the Mt. Pitt mine on Jump-off-Joe, near Grants Pass, there is 1,100 ft. of tunnel on the property. A compressor and power drills are to be put in. The power will be had from a water wheel.

SOUTH DAKOTA.

Lawrence County.

The Lundburg-Dorr mill at Terry is to be increased in capacity by the addition of another sand tank, which will give the mill a capacity of 125 tons of ore per day. The mill is taking in about half its capacity in custom ore from some of the Bald mountain mines.——The Horseshoe Mining Co. is making preparations to turn out its full capacity of ore for the Pluma mill as soon as the plant can be completed.——The Mogul shaft is being unwatered preparatory to taking out ore from the old workings.

TEXAS.

Although extensive repairs have been made in the old Federal smelter at El Paso, and it stands ready for operation at any time, the furnaces have not been started and ore is not yet arriving for treatment.

UTAH.

Grand County.

The Basin Placer Mining Co., which began work December 1, has reached a depth of 1,100 ft. with its bedrock tunnel, which has a vertical depth of over 350 ft. in wash gravel, with no signs of bedrock.

Juab County.

The shaft of the Snowflake mine, near Eureka, is below the 950-foot level and will be continued to the 1000-ft. when drifting will be started.

Salt Lake County.

E. A. Wall has closed down his Bingham mill until the worst of the winter weather is past, and will start on ore from the Phœnix mine.

Summit County.

The Comstock mine in Thaynes canyon, Park City, has been closed after many years of fruitless work. The mine is well equipped.

WASHINGTON.

King County.

James A. Moore of Seattle has left for the East to complete arrangements for the erection of a blast furnace near Seattle, with a capacity of 500 tons daily.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District.

Two causes contributed to the smallness of ore shipments from the Boundary mines for the week ending January 6. One was the stoppage of operations by the British Columbia Copper Co. and the Dominion Copper Co., while an agreement was being arranged with the smelter employees regarding an eight-hour day, and the other is the fact that shipments are only figured from the first day of the year, and not for a full week. The output reported was: Granby mines to Granby smelter, 5,114 tons; Emma to Nelson smelter, 191 tons; Providence to Trail smelter, 30 tons; Elkhorn to Trail smelter, 15 tons; Prince Henry to Trail smelter, 15 tons; total for week, 5,365 tons.

MEXICO.

Baja Californ'a.

R. Grivel and Archie Priest, of San Diego county, Cal., are at Ensenada arranging for the sale of their mining properties, about 40 miles southwest of Calexico, to the Benedictine Mining & Milling Co.

Hidalgo.

The shaft of the Santa Gertrudis mine, at Pachuca, in which fire broke out recently, is being repaired. The fire was stopped by suffocation.

Tepic.

The mining district of Compostela, south of Tepic, is being re-opened. The construction of the Guaymas-Guadalajara extension of the Southern Pacific into Tepic will place transportation facilities within easy reach of the mines in the district.——Arthur H. Brewer of Guadalajara is developing old mines on the Espiritu Santo mountain, and is giving employment to 50 men. His holdings include the old Condesa, Frazada, Rosario and San Ignacio mines. Mr. Brewer plans the erection of reduction works.——John Earven of San Francisco is reopening and developing the San Rafael mine in the Compostela district.——Part of the Bartolo mines, southeast of Tepic, have been denounced by Thomas Johnston and N. W. Kinross.

Sonora.

The Yaqui River Smelting & Refining Co. at Toledo are successfully running the new reverberatory furnace recently completed, and are making regular shipments of matte.——H. J. Wood & Co. of Hermosillo have secured, for the Gold Bullion Mining Co., titles to the Etna and Victoria mines at Minas Prietas. The company have commenced sinking a three-compartment shaft. Pedro Penelli is in charge.

Personal.

W. H. ALDRIDGE is at Montreal.

F. W. BRADLEY is on his way to New York.

MARK L. REQUA has returned from New York.

E. DELAFOND, of Mexico City, is at the St. Francis.

R. J. GRANT, of Denver, is examining mines in Mexico.

LEO VON ROSENBERG has returned to New York from Mexico.

J. H. MACKENZIE has returned to San Francisco from London.

EDWARD HAND is manager of the Ymir mine, British Columbia.

ROBERT M. RAYMOND is visiting New York from El Oro, Mexico.

E. R. ABADIE, of Randsburg, California, is at the Palace hotel.

W. SPENCER HUTCHINSON of Boston is examining mines in California.

LLEWELLYN HUMPFREYS, who was lately married, is visiting San Francisco.

COURTENAY DE KALB is on his way to Guadalupe y Calvo, in Chihuahua, Mexico.

OSCAR D. CHAMPION has received an appointment at the Sao Bento mine, in Brazil.

EDWARD G. STOIBER is visiting Denver, from Paris, where he now makes his home.

MR. J. TROWBRIDGE BAILEY, of New York, has been examining mines in South Dakota.

W. W. MORSE has charge of the construction of the new smelter at Chihuahua, Mexico.

C. H. MUNRO has returned to Portland from San Francisco and will soon go to Alaska.

A. C. RISER has succeeded O. Wiser as superintendent Annie Laurie mill at Kimberly, Utah.

NOBLE C. BANKS is erecting a 120-stamp mill at the Cerro Prieto mines in Sonora, Mexico.

ARTHUR M. DAVIS, manager Capuzaya Mining Company, has returned to Parral, Mexico.

JAMES STEVENS, superintendent Silver King mill at Park City, Utah, is visiting California.

E. H. MESSITER, on his return from France, has left New York to proceed to Cananea, Mexico.

ELMER AXFORD is superintendent Bullion Gold Mining & Milling Company at Lead, South Dakota.

BENNETT OPIE has been re-elected superintendent Pennsylvania mine at Grass Valley, California.

WILLIAM ENGELS is in charge of the Engels Copper Mining Company in Plumas county, California.

J. H. TIBBITTS has resigned as superintendent Head-Waters mine and is now at Redding, California.

STANLEY H. PEARCE is engineer with the Black Mountain Mining Company, at Magdalena, Sonora.

ROBERT T. WHITE is erecting the new smelter at the Balaklala copper mine, in Shasta county, California.

ALGERNON DEL MAR is superintendent for the Edel Mining Company at Enterprise, in Butte county, California.

A. E. S. PRICE has been appointed superintendent Dardanelles Mining & Milling Company at Searchlight, Nevada.

JAMES A. RICKARD has left the Peyrebrune mines and is now manager of the Mines de l'Aude, at Lastours, in France.

B. A. LASELLE has left New York, via Panama, to examine and report upon placer mines in Sandia district, eastern Peru.

P. O. WELS has resigned from the Lake Superior Smelting Company to go with the International Ore Treating Company.

R. T. BAYLISS AND PHILIP L. FOSTER, chairman and consulting engineer, respectively, of the Exploration Company, are in New York.

JAMES M. DIKEMAN, formerly with the Liberty Bell Company of Telluride, has just returned from South Africa and will settle in California.

O. WISER has resigned as superintendent Annie Laurie mill at Kimberly, Utah, to look after his interests in the Gold Butte district in Nevada.

DUNCAN MCVICHIE, of Salt Lake City, consulting engineer Balaklala Consolidated Copper Company, is visiting the mines at Kennett, Shasta county, California.

H. N. EDMONDSON, formerly assistant manager Dolores Mining Company, has taken the position of superintendent of the Parral Corporation, which owns the San Patricio mine, near Parral, Chihuahua, Mexico. Claude Easley, late of the United Parral Mines Company, will be his assistant.

Obituary.

JOSEPH R. FOCHT, superintendent of construction of the new concentrating mill of the Utah Copper Co., died of heart trouble, January 5, at Salt Lake City, age 32.

Latest Market Reports.

SAN FRANCISCO, January 11, 1906.

ANGLO-AMERICAN SHARES.

London, January 11, 1906.

	£ s d		£ s d
Camp Bird	1 11 6	Oroville	0 18 9
El Oro	1 8 9	Stratton's Independence	0 8 6
Esperanza	5 6 3	Tomboy (ex div.)	1 6 3
Dolores	2 1 3		

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. January 11, 1906.)

Amalgamated	111⅛	North Butte	87
Anaconda	262	Old Dominion	40¼
Bingham Copper	37	Shannon	8
Daly West	17⅛	Tennessee Copper	51
Granby	9⅛	Tonopah-Nevada	20⅛
Greene Consolidated	29⅛	United States	49
Nevada Con. Copper	12	Utah Copper	38⅛

SAN FRANCISCO QUOTATIONS.

Ophir	5⅞	Potosi	5
Con. Virginia	120	Red Dog	205
Hale & Norcross	100	Sandstorm	130
Jim Butler	90	Savage	48
Mexican	115	Tonopah Ex	7¼
Mohawk	45	West End	175
Ohio Tonopah	32	Yellow Jacket	13

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: London, 30½d (standard ounce, 925 fine); New York, (By Wire), bar silver, 65⅝c, refined (1000 fine); San Francisco, 65½c; Mexican dollars, 51@53c, San Francisco; 50½c, New York.

COPPER.—New York (by wire), Lake, 18½ @ 19c; Electrolytic, 18⅝@18¾c; Casting, 18@18⅝c. per pound. Mill copper plates, $21.00; bars, 21@24c. London: £79 2s 6d spot per ton.

LEAD.—New York (by wire), $5.60; San Francisco, $5.15, carload lots; 5¼c 1000 to 4000 lbs.; pipe 7½@8⅝c; sheet, 6¾@8¼c; bar 6¾c. London: £17 ℔ long ton.

SPELTER.—New York (by wire), $6.65; London, £29 5s ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $36.55@36.75; bar tin, ℔ lb., 40c.; pig, 38c. London, £185 10s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $37.50@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35@18.85; gray forge, $14.60; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ¼c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7¼c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 11½c; Hallett's, 12½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8½c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11¾c; 14 oz., 10@10½c; 12 oz., 9½@9¾c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

OILS.—Linseed, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

Books Received.

'The Production of Aluminum and Its Industrial Use,' by Adolphe Minet. Translated with additions, by Leonard Waldo. The book consists of three parts: Part I.—Processes for the Production of Aluminum: A. Chemical Method of Producing Aluminum: *a.* Processes based on the Reduction by Means of Sodium; *b.* Processes which do not Employ Sodium. B. Electro-Chemical Methods of Producing Aluminum: *a.* Electrothermic Processes; *b.* Electrolytic Processes for the Production of Aluminum. Part II.—Aluminum and its Alloys, Methods of Working and Uses: A. The Aluminum Industry. B. Aluminum and its Alloys: *a.* Pure Aluminum; *b.* Heavy Alloys; *c.* Alloys of Medium Density; *d.* Alloys of Various Densities; *e.* Light Alloys. C. Working of Aluminum; Process of Soldering Aluminum; Electroplating Aluminum. D. Uses of Aluminum: *a.* In Commerce and Minor Industry; *b.* In Greater Industry; *c.* In Chemistry and Metallurgy; Aluminothermy, and the Appendix, consisting of supplementary notes by Adolphe Minet, on industrial questions and the theoretical part. It is published by John Wiley & Sons, New York City, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $2.50.

Although probably written with no such intent, yet the great result attained by 'The Economics of Mining' is showing the close relation between the operator and the investor and how such relations may best be subserved. The book comprises reprints of a number of articles relative to the cost of mining that have appeared in recent copies of the *Engineering and Mining Journal.* Included are articles dealing with the ethical and financial aspects of the industry. These articles have been written by some of the best known mining engineers of the day and present the results of wide practical experience under varied conditions. The first question that suggests itself to the reviewer is why a number of apparently irrelevant subjects should be abstracted from the files of a technical journal and be printed together in a single book. The favorable answer is found in the unifying and correlative work of the editor, T. A. Rickard. As the topographer unites the detail maps of a vast region by his triangulations, so has Mr. Rickard determined the bearings of the various details to the field of successful mine management. The true place of each with reference to the science that treats of the development of mining resources is shown by able editorial comments. The main subjects discussed are the valuation of mines, including a clear-cut statement of the methods of mine finance, costs of mining and milling in all parts of the world, the ratio of equipment to ore reserves, methods of mine accounts, and details of special methods in various localities. Each is discussed by a specialist and presents the results of his own experience. Mine managers will find practical pointers in the chapters on mine accounts. Stockholders and investors will be especially interested in the portrayals of methods of mine valuation and flotation. For the superintendent it gives comparative costs and methods, for the investor it gives an unequalled statement of the elements of mine valuation, and for both it emphasizes the close relationship that each should bear to the other in effecting profitable mining. It is a book which should find a place in the library of every man interested in the development of our mineral wealth. The book will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $2.

Trade Treatises.

Geo. W. Pennington Sons, INC., of San Francisco, have issued a very attractive calendar for 1906.

Bulletin No. 62, issued by the Crocker-Wheeler Co., covers the field of "Electric Hoisting Machinery."

Bulletin No. 1,048 of the electrical department of the Allis-Chalmers Company of Cincinnati, Ohio, illustrates and describes the construction of Bullock alternating current generators of engine and fly-wheel types with revolving field.

The Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N. Y., and Chicago, interestingly portray the details and advantages of private branch telephone exchanges in Bulletin No. 14, which contains material of interest to managers of large mines in need of more centralized intercommunication.

Commercial Paragraphs.

THE Rapid-Economy Stamp Mill Co. report sale of three-stamp battery to L. A. Hughes of Durango for immediate shipment.

THE Ingersoll-Rand Co. announce that they have secured exclusive control of the product of the Imperial Pneumatic Tool Co. The line of Imperial tools includes pneumatic hammers, drills, riveters, reamers, hoists and plug drills.

THE Colorado Iron Works Co. reports the sale of three large sets of Humphrey rolls to the American Smelter Securities Co. for their Garfield plant. The same company is building for the Hall Mining & Smelting Co., Nelson, B. C., the equipment for a complete crushing and sampling plant in which six impact screens will be installed, an automatic bedding system consisting of conveyors with reversing trippers, an automatic mixing and distributing system for crushed material for the lead-converting plant and a car-haul system, requiring 17 cars and 24 turntables.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING DECEMBER 26, 1905.

808,195.—BARREL TAP - M. J. Chaplin, Seattle, Wash.
808,231.—SWITCH—J. M. Comer, Seattle, Wash.
808,198.—VALVE—M. O. Dolson, Los Angeles, Cal.
808,199.—SWIVEL—E. Double, Los Angeles, Cal.
808,521.—WASHING MACHINE—Dyke & Alderman, Walla Walla, Wash.
808,525.—WATER HEATER—J. P. Erle, Los Angeles, Cal.
808,527.—LOADING APPARATUS—J. M. Ferrish, Tacoma, Wash.
808,529.—OIL BURNER—B. O. P. Foss, San Jose, Cal.
808,356.—TUBE MACHINE—N. Foster, Tacoma, Wash.
808,444.—HOSE CLAMP—Gergersen & Parr, Seattle, Wash.
808,235.—PIPE PERFORATOR—E. R. Graham, Coalinga, Cal
808,361.—ROASTING ORES—H. Haas, San Francisco.
808,201.—SHOW WINDOW—G. T. Hadley, San Francisco.
808,369.—BED BOTTOM—J. Hoey, San Francisco.
808,202.—GLASS CARRIER—J. Hunter, Los Angeles, Cal.
808,376.—DOOR LATCH—J. S. Johnson, San Francisco
808,286.—STEAM GENERATOR—W. L. Jones, San Francisco.
808,242.—WINDOW SHADE—E. C. Jordan, Los Angeles, Cal.
808,608.—PUMP—E. E. Kretzschimar, Alameda, Cal.
808,387.—PHOTO APPARATUS—C. J. Kurtz, Salem, Or.
808,460.—INSECT TRAP—G. Laube, Santa Monica, Cal.
808,289.—CLUTCH—A. Lee, Bellingham, Wash.
808,243.—BORING MACHINE—J. Lund, San Francisco.
808,464.—FRUIT PITTER—K. T. Lynn, Fresno, Cal.
808,469.—PENHOLDER—F. B. McDonald, El Dorado, Cal.
808,294.—AWNING BOX—E. T. Meakin, San Francisco.
808,397.—MUST DISTRIBUTOR—E. T. Meakin, San Francisco.
808,250.—WRENCH—B. F. Meadrow, Anacortes, Wash.
808,109.—TROLLEY—Osburn & Coad, Pasadena, Cal.
808,216.—CAN FILLER—D. W. Rathbone, Seattle, Wash.
808,260.—KNIFE SHARPENER—J. A. Stansbury, Los Angeles, Cal.
808,132.—PILE DRIVER—A. E. Williams, Douglas, A. T.
37,759.—DESIGN—K. Gakushiji, San Francisco.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency the following are worthy of special mention:

DOOR-LATCH ATTACHMENTS.—No. 808,376. December 26,1905. Joseph S Johnson, San Francisco, Cal. This invention relates to an announcing attachment for the latches of doors. It consists of a sounder and means whereby the attention of the inmates of a room will be attracted by the turning of a knob to open the door. It may be so constructed as to make one or a plurality of strokes during the turning of the knob in each direction. If it is desired to disengage the sounding mechanism, it is effected by means of a pivoted arm which is turnable, so that it will press the end of the arm downward sufficiently to carry it out of the line of movement. The knob can then be turned and the door opened without alarm. The device comprises the combination of a latch bolt provided with teeth, a bell or sounder, and a pivoted hammer-operator, of a rocking arm having one portion provided with a line of teeth to engage the hammer-operator and having a hub portion provided with teeth to engage those on the bolt whereby the hammer-operator is positively moved by both the hammer-operator on the bolt whereby the hammer-operator is positively moved by both the forward and rearward movement of the bolt

MEASURING SPOONS.—No. 808,967. Jan. 2, 1906 William H. Arrowsmith, Oakland, Cal. This invention relates to a device for conveniently measuring materials, and especially such materials as are used in pulverized or powdered form. It is the object of this invention to provide a measuring device which is adjustable and will be sufficiently accurate for the required use. The device consists of a tube having an extension cut down to approximately half the diameter of the tube, said extension having a hemispherical closed end, a plug slidable in the tube and having an extension cut down to correspond with the shape of the tube extension, a slot in the tube having transverse notches, and a spring-latch carried by the plug and adapted to engage with the notches of the tube.

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SAN FRANCISCO, JANUARY 20, 1906.

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EDITORIAL.

THE mines of the Rand made a record output in the last month of 1905. The Transvaal Chamber of Mines reports the yield as 431,594 fine ounces, worth $8,921,048. For the year the production was $101,850,000, an increase of $24,000,000 over 1904. Further increase is expected during the current year.

OUR distinguished contemporary, *The Iron Age*, celebrates its semi-centennial with the issue just to hand from New York. We offer hearty congratulations. In its high character, continuity of purpose and successful enterprise, *The Iron Age* has set an example in trade journalism such as its contemporaries can well afford to imitate. We trust that Mr. Richard Williams and Mr. Charles Kirchhoff may long continue to direct so useful an organ of industrial knowledge.

SAN FRANCISCO foundrymen are doing better for their customers than is to be expected in these days of industrial combinations; they are still selling castings at the rate demanded before pig iron and coke rose to their present high prices. Other industries, especially where consolidated into trusts, have raised the price of manufactured articles in accordance with the advanced cost of the raw material, and beyond that; but the foundrymen have omitted to do so, not from any altruistic motive, but because the competition was too severe to permit departure from an established rate. The brass foundries put up prices long ago, but the dealers in iron have kept apart, each for himself, and stuck to the old prices, despite the fact that pig iron has gone up $7 per ton. We do not make these remarks to incite the machinery people to higher charges, but to advise our mining friends, who are likely to need castings in the near future, to get them before the market goes against them.

The State Mining Bureau.

California has reason to be proud of the work done by her State department of mines, the Mining Bureau. As a rule the official connection between the several Western States and the mining industry to which they owe their existence, takes the form of a semi-political office endowed with a salary large enough to attract the office-seeker, yet insufficient to afford a livelihood to a capable professional man. In consequence, the mining bureaus and geological surveys of most of the States are so badly financed as to be unable to do serious work; either they are managed by second-rate politicians or else they are adorned by earnest scientific men who are vainly endeavoring to do something with nothing. As an office for the authoritative collection of statistical information and as the publishing medium for a number of useful treatises, the Mining Bureau of California is well known wherever mining men congregate. It is worthy of the support of the people of the State, and more especially of those who desire to promote the best interests of the industry that made California a great commonwealth. It needs active support, if the signs are to be read rightly. We are now in January, 1906, and yet the appointment to the position of State Mineralogist has not been made by the Governor. It is nearly a year overdue. When the Executive chose the trustees of the Mining Bureau, in November, there was hope that the chief post would shortly receive his effective attention. The trustees were admirably selected, they are men thoroughly known to the mining community and experienced in such matters as appertain to the Bureau. Mr. Lewis E. Aubury, who has served one term of four years, remains State Mineralogist until his successor is named. It is fair neither to the present occupant of the post nor to his eventual successor to postpone the appointment so long. If Mr. Aubury is the man, let him receive proper confirmation, so that he may attend to his duties with a good heart; if he is not to be his own successor, let this other begin his duties as soon as possible. The case reminds us of the present anomalous condition of the Canadian Geological Survey. When George M. Dawson died, Dr. Robert Bell succeeded temporarily to the duties of director. This happened five years ago, but Dr. Bell remains "acting director." A grave injustice has been done to him and to the Survey. The energies of the chief and of his subordinates have been weakened by the cliques formed to support one or other candidate for the position, the actual director has had his authority undermined by the uncertainty of his tenure of office and the Survey as a body has lacked the solidarity belonging to an organization having its properly appointed head. In other words, it is a mistake, either at Ottawa or at Sacramento, to sacrifice work of great usefulness to the exigencies of a political lobby.

The Mining Bureau gets scant recognition from the State. At one time the appropriation was as much as $50,000 per annum. Nowadays it is only $17,000. After paying such fixed charges as the salaries of the mineralogist, the librarian, the chemist, together with laboratory and office expenses, etc., there is about $250 per month left over for actual fieldwork. This, the most important of its functions, is sadly neglected; the best products of the Bureau have been bulletins based on fieldwork, such as Preston on gold-milling practice, Hans Behr on mine drainage, Prutzman on petroleum, Storms on mine timbering, Kunz on precious stones, Fairbanks on the geology of the Mother Lode, McGillivray and Doolittle on gold dredging, and other publications, the editions of which have usually been exhausted all too soon. A region that has a mineral output valued at 45,000,000 dollars per annum ought to be able to set aside something better than $17,000 for the office that is designed to promote the exploitation of resources only half-known. The State Mineralogist gets $3,000 per annum—quite enough for a place-hunting politician and not nearly enough for a man who has equipped himself, by education and experience, for such a post. Of course, the professional man who accepts office under the State cannot expect to receive pay equal to that of a successful practitioner; the holding of an honorable office confers a distinction and permits of a manner of life which should be more agreeable than the brilliant uncertainties of a professional career. On the other hand, it is high time to recognize the fact that if the State pays a mere fraction of the salaries that corporations willingly accord, it must either get men poorly qualified or else wink at queer doings. Occasionally a man with a self-supporting income takes office for the honor of it; that is ideal, but infrequent. Applying this argument to the office of State Mineralogist, we consider that, in this day and generation, things being as they are, $5,000 is a minimum salary for such a post, if it is to be filled by a capable man, willing to attend solely to the duties of the office. We trust sincerely that any idea of attempting to ride two horses, to serve the State while promoting mines, continuing private engineering practice, running a newspaper, or any other shifty compromise will not be entertained. That way lie inefficiency and scandal. We have expressed ourselves frankly, having no personal interest in the appointment or in the political undercurrents that may move it; although we believe that our views will be endorsed by those who have at heart the best interests of mining in California.

A Mare's Nest.

We have been taguht to regard the statistical reports of the Geological Survey as gospel, hence our grief to find that the mining of tin in Indiana has made the fortunes of enterprising individuals living in the hoosier State without any record appearing in the statistical yearbook published at Washington by Dr. David T. Day and his accomplished aides. In the *World's Work* it is related that a junior officer of the Pennsylvania Railroad visited Wales and obtained a knowledge of tin; he became fascinated with the subject; "he talked tin, he thought tin, he dreamed of tin." On his return he built (so it is said) a tin mill and proceeded to exhibit the manner in which it is possible, at short notice, to make an "honest fortune." Of course, we had read somewhere that "pig tin has not been produced in the United States since the calendar year 1893," but this turns out to be one of those conservative statements due to ignorance of what is really going on within our vast mining regions.

The fact is, popular magazines make curious errors.

Tin mining is almost extinguished—but not quite—in the United States. Gaffney in South Carolina and Lost River in Alaska produced tin last year; so also did certain young mines of Cape York and in South Dakota. But tin is not a product of Indiana. The writer of the article referred to must have floundered in his terms, confusing pig tin with tin plates—the plates which are manufactured in Indiana from American iron and from tin that comes either from Cornwall or the Malay peninsula. The tin of Indiana must share the fate of the gold in sea water and the brass in Maine, companies having been organized to exploit both these resources, natural and unnatural, respectively. The gold in sea water is like the heat in moonshine—it is there, but the percentage is below the commercial limit. As to brass in Maine, that was mentioned in a recent prospectus of a company anxious not to omit any chance of expanding its operations. Of course, there is brass in Maine, there is brass in every country, even in Gaul. But the brass industry flourishes best in Connecticut, where manufacturers are content to make an alloy of copper and zinc. Of copper and zinc there is a plenty, but of tin there is a great scarcity in North America. The gentleman from Indiana who "dreamed of tin" may have been a prophet unwittingly, and the day may yet come when the tin-plate manufacturer of his State will make a real "honest fortune" from an industry based upon the application of Alaskan tin to the iron of Minnesota.

Ore Deposition and Deep Mining.

Waldemar Lindgren has won such a reputation as an authority on the geology of ore deposits that his article, in this issue, on the relation of this subject to deep mining, is sure to prove interesting to many readers. His verdict is, in the main, favorable to the persistence of ore, especially in California. Mining operations have emphasized such a view, and if we differ from him it is only in regard to certain generalizations which it seems to us that mining in its world-wide aspect does not endorse. The intersection of a diorite, granite, or any other rock known by its structure to have been consolidated at a great depth, does not prove that the vein intersecting it was also formed at a great depth. It may have been formed after erosion had brought the deep-seated rock in close touch with the surface. The main question is the amount of that erosion before the vein was formed and the amount that has taken place since that time. In the absence of evidence proving geological antiquity, experience has taught that it is safest to assume the formation of the ore to have been, geologically speaking, of comparatively late date. Most of the ore deposits valuable to man represent the last phase in a process of concentration, which began after the vein-fracture or lode-channel was formed; but it was a process which was resumed whenever thermal activity prevailed, and it must have been most effective when the conditions favoring precipitation were at their best, concurrently with a generous circulation of mineral-bearing waters. Such conditions, favorable to deposition, are usually found in the approach to surface, because in that vicinity the chemical and the physical factors induce precipitation, just as with increasing depth there is greater tendency to solution.

As to the amount of vein removed by erosion in such mining regions as Victoria and California, that is a nice question. Mr. Lindgren assumes a thickness of 3,000 feet as having been scored away since the veins were originally formed. This is not as much as many less careful writers have vaguely assumed. One becomes cautious in making estimates when it is seen how glacial striæ made ten thousand years ago survive to this day. If a groove cut an inch deep in granite is not wiped out during ten thousand years, how long will it require to remove a depth of half a mile of granite? Time sufficient to produce local enrichments in a vein or concentration of ore in a lode is conceivable without asking for the period which must elapse while anything from half a mile to a mile of rock is gnawed away by the teeth of erosion. As far as we know from actual mining, a total depth of 5,000 feet for any vein that carries ore is expecting a good deal. Quartz veins without ore undoubtedly go deeper, but economic geology is not interested in silica, there being enough of it for our immediate wants at the surface itself.

The Rise in Anaconda.

The recent meteoric rise in the market value of Anaconda shares illustrates methods that were more common in the barbaric stage of the mining industry than they are today among those who regard it as a legitimate business. Early in November Anaconda sold at 116; at the end of that month it stood at 155; on December 16 it reached 196; fourteen days later 295, and on January 2 it attained a maximum of 298—a total rise of 182 points in two months. Since then, of course, it has reacted, down to 236 and up to 265. Our readers will recall similar fluctuations. In 1901, with copper at 17 cents, the company earned a surplus of $5,571,816, equal to 18 per cent on its capital stock of $30,000,000. In April of that year shares sold at 217. Copper fell to 13 cents and the quotation for Anaconda shares fell with it to 113. In 1902, copper sold at 12 cents, the earnings of the company were only $1,601,201, and the shares fell to 58. And so on. In their annual report, issued last April, the directors of the Amalgamated Copper Company, which now controls Anaconda, stated that a fluctuation in the price of copper from 11.70 to 16.50 cents per pound meant a difference of $9,700,000 in their net earnings, or over 6 per cent on the $155,000,000 which represents the capital stock of the Amalgamated Copper Company.

The recent rise in the price of Anaconda began when the price of the metal copper commenced to climb, but it was stimulated largely by the rumor of an increased dividend, to be declared next April. This is a good example of the manner in which Wall Street discounts the effect of coming events. On the top of these expectations there came "unofficial" talk of a big discovery in the mine. These unofficial statements were freely circulated, they were wholly irresponsible, but quite effective for their purpose—of booming the stock market. It was said that there had been struck at the deeper levels a new lode forty-five feet wide, assaying 15 per cent, as compared to the ordinary average of Anaconda ore, namely, 4 per cent. No official statement has been made, no proper information has been vouchsafed the shareholders, everything is kept as mysterious as in the times of Mackay and Fair on the Comstock. The business is managed for the benefit of insiders, just as thoroughly as in the old days when Virginia City astonished the world with her output of silver and incidentally demoralized mining for a whole generation.

In 1871 Mackay and Fair secured the Con. Virginia mine for $26,000. In 1873, the 108,000 shares sold for $45. Shortly afterward rumors of the great bonanza leaked out. In November, 1874, the shares stood at 115; a month later they jumped to 610, and in January, 1875, they were quoted at 700. The companion mine, the California, had the same story, the shares rising from 37 to 780. The market valuation of the consolidated mines rose from $40,000 in 1869 to $160,000,000 in 1875. The game was as well played as that of a faro dealer or a modern buccaneer from the wilds of Manhattan. Within five years the group of bonanza mines on the Comstock dwindled in market value from $393,000,000 to $7,000,000. In the meanwhile whole fortunes had changed hands, the star players had made a colossal clean-up and a few thousand of the ordinary sort of people had been hopelessly ruined. In any event, of course, there would have been a big rise and the chance to gamble on a large scale; but the tactics of the "big four," Mackay, Fair, Flood and O'Brien, were intended to make the most of all possible exaggeration, and the market value of the mines was inflated to three or four times the amount warranted by the facts.

All such manipulation is hurtful to mining. Some one has to pay the difference between the actual investment value of the stock and the fictitious price to which it is boosted. The desire of all those who have at heart the best interests of the industry must ever be that money shall be made as much as possible by actual mining, milling and smelting operations and as little as possible by playing upon the gullibility of the simple, the greed of the covetous or the good faith of the inexperienced.

By the Way.

In his presidential address, before the South African meeting of the British Association for the Advancement of Science, Professor George Darwin, among other things, said:

Bartholomeu Diaz, the discoverer of the Cape of Storms, spent 16 months on his voyage, and the little flotilla of Vasco da Gama, sailing from Lisbon on July 8, 1497, only reached the Cape in the middle of November. These bold men, sailing in their puny fishing-smacks to lands unknown, met the perils of the sea and the attacks of savages with equal courage. How great was the danger of such a voyage may be gathered from the fact that less than half the men who sailed with da Gama lived to return to Lisbon. Four hundred and eight years have passed since that voyage, and a ship of 13,000 tons has just brought us here, in safety and luxury, in but little more than a fortnight.

I am told that in the United States the phrase "I want to know" has lost the simple meaning implied by the words, and has become a mere exclamation of surprise. Such a conventional expression could hardly have gained currency except among a people who aspire to knowledge. The dominance of the European race in America, Australasia and South Africa has no doubt arisen from many causes, but among these perhaps the chief one is that not only do "we want to know," but also that we are determined to find out. And now within the last quarter of a century we have welcomed into the ranks of those who 'want to know' an oriental race, which has already proved itself strong in the peaceful arts of knowledge. To us living men, who scarcely pass a year of our lives without witnessing some new marvel of discovery or invention, the rate at which the development of knowledge proceeds is truly astonishing; but from a wider point of view the scale of time is relatively unimportant, for the universe is leisurely in its procedure. Whether the changes which we witness be fast or slow, they form a part of a long sequence of events which begin in some past of immeasurable remoteness and tend to some end which we cannot foresee.

The discrimination of the truth from among discordant records is frequently a work demanding the highest qualities of judgment; yet when this end is attained it remains for the historian to convert the arid skeleton of facts into a living whole by clothing it with the flesh of human motives and impulses. For this part of his task he needs much of that power of entering into the spirit of other men's lives which goes to the making of a poet. Thus the historian should possess not only the patience of the man of science in the analysis of facts, but also the imagination of the poet to grasp what the facts have meant.

The test of a scientific theory lies in the number of facts which it groups into a connected whole; it ought beside to be fruitful in pointing the way to the discovery and co-ordination of new and previously unsuspected facts. Thus a good theory is in effect a cyclopedia of knowledge, susceptible of indefinite extension by the addition of supplementary volumes.

The fundamental idea in the theory of natural selection is the persistence of those types of life which are adapted to their surrounding conditions, and the elimination by extermination of ill-adapted types. The struggle for life among forms possessing a greater or less degree of adaptation to slowly varying conditions is held to explain the gradual transmutation of species.

The complex inter-actions of man with man in a community are usually described by such comprehensive terms as the State, the Commonwealth, or the Government. Various States differ widely in their constitution and in the degree of the complexity of their organization, and we classify them by various general terms, such as autocracy, aristocracy or democracy, which express somewhat loosely their leading characteristics But, for the purpose of showing the analogy with physics, we need terms of wider import than those habitually used in politics. All forms of the State imply inter-relationship in the actions of men, and action implies movement.

In the world of life the naturalist describes those forms which persist as species; similarly the physicist speaks of stable configurations or modes of motion of matter; and the politician speaks of States. The idea at the base of these conceptions is that of stability, or the power of resisting disintegration. In other words, the degree of persistence or permanence of a species, of a configuration of matter or of a State depends on the perfection of its adaptation to its surrounding conditions.

The evanescent type of animal life has often been preserved for us, fossilized in geological strata; the evanescent form of Government is preserved in written records or in the customs of savage tribes; but the physicist has to pursue has investigations without such useful hints as to the past.

The fascinating idea that matter of all kinds has a common substratum is of remote antiquity. In the middle ages the alchemists, inspired by this idea, conceived the possibility of transforming the baser metals into gold. The sole difficulty seemed to them the discovery of an appropriate series of chemical operations. We now know that they were always indefinitely far from the goal of their search.

CONCENTRATES.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

THE phosphates of the alkaline earths are insoluble in potassa, and soluble in acetic acid.

♣♣♣♣

LITHIA is precipitated from concentrated solutions upon heating by hydric-disodic phosphate.

♣♣♣♣

A MINING LOCATION made on Sunday or a legal holiday is valid. The law makes no exceptions in this regard.

♣♣♣♣

OXIDES are precipitated as sulphides by hydrogen sulphide from their solutions, acidulated by hydrochloric or nitric acid.

♣♣♣♣

IT costs from $3 to $5 per cubic yard to break rock to pass a 2-in. ring by means of hand hammers, where wages are $2 per day.

♣♣♣♣

GOLD-BEARING VEINS are not commonly found in rhyolite, though the occurrences at Goldfield, Nev., and vicinity are an important exception.

♣♣♣♣

WHERE gold ores are crushed in cyanide solutions, amalgamation on outside plates is usually unsatisfactory for the reason that the cyanide renders the plates hard and unfit for the amalgamation of the gold.

♣♣♣♣

DOLOMITE may be employed as a flux for pyritic ores. Dr. F. R. Carpenter had no other kind of limestone at the Deadwood & Delaware smelter, and the dolomite was found to fulfill every requirement.

♣♣♣♣

IT is generally more economical to employ a large rock-breaker of great capacity that will crush the ore in a short time than to use one which must be kept constantly in operation in order to keep the mill supplied with ore.

♣♣♣♣

OIL WELLS known as 'gushers,' which start with a large flow, are usually less enduring than pumping wells; in fact, are often short-lived, but their aggregate production may equal that of a pumping well with a low daily output.

♣♣♣♣

AS to whether the amalgam taken from that portion of a mill plate nearest the mortar is higher grade, or the gold of greater fineness, than that obtained further away from the lip of the mortar can only be determined by trial in each case.

♣♣♣♣

THE oxides of tungsten and of vanadium are precipitated as sulphides only when their solution mixed with ammoniac sulphide is decomposed as an acid. The solution of tin sulphide in ammoniac sulphide is precipitated by acids as SnS_2.

♣♣♣♣

THE analysis of slags made at the Deadwood & Delaware pyritic smelter by F. A. Carpenter, when using dolomite as flux, ranged from 45.7 to 50.6% SiO_2; 9.64 to 17.6% FeO; 2.3 to 7% Al_2O_3; 17.9 to 22.6% CaO; 9.1 to 12.9% MgO, with oxygen in acid, 1.53 to 1.84, and oxygen in base, 1.

♣♣♣♣

WHILE certain kinds of dike rock may be a favorable indication of ore, or lead to ore, in some districts, such as the phonolite and basalt dikes of Cripple Creek district, Colorado, this cannot be laid down as a law, for in most places where phonolite and basalt occur elsewhere, no ore is known.

♣♣♣♣

TIMBERS used in mill foundations, tramway sills, headframe sills, collar sets of shafts, and in any place where the timber will be in contact with earth, should be treated with some preservative, to prevent speedy decay. At some shafts concrete is built about the collar to render the work permanent.

♣♣♣♣

MUCH of the so-called "Mud cour ce, in the vicinity of Calico and Daggett, San Ber- ounty, Cal., contains calcium borate. This r building coils of volcanic origin, being fine volcanic increase in the posited in a Tertiary lake bed, now ough the manufac laces, in the Calico and Daggett hi an in 1875, and in 1889 wa of only $500,000, in 1903 it

THE greatest strain upon . In 1904 the production the load is started or stopp 26,505,881 bbl., valued at must be strong enough to ount Pennsylvania produced skip, ore and the rope it ifornia 1,014,558 barrels. sufficient to stand t stresses and sudden to 6 is calculated f was delayed last week by a cause ntrol. We hold an official receipt

IN gold quar apers were received at the San Franwalls usually c fice at 2:20 p. m. on Friday. The delay but to a less is due, we understand, to a shortage in This sulphid caused by the demand upon the San quartz and Post Office for expert men to work on the phide, owin nail across the continent. require siz

ing concentration if satisfactory results are to be obtained on the machines.

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THE Ziervogel process is based upon the fact that silver in copper matte is converted into silver sulphate by means of sulphuric anhydride evolved from iron and copper sulphides present in the matte. The process consists in roasting the sulphides in excess of air so that they become partly sulphates, which are then heated sufficiently to decompose the sulphates of iron and most of the sulphates of copper, while the silver remains sulphatized and may be dissolved out with boiling water and precipitated later on sheet copper.

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THE first gold mining done in the United States was probably in Georgia, as early as 1826. The discovery of gold-bearing quartz is said to have been made by two English peddlers, who found 'specimen' rock on land now owned by the Columbia Mining Company in McDuffie county. It is said that a single individual bought up a large tract of land in the gold region at that time; but, having no knowledge of mining and failing in the first attempt, discontinued investigation, and the land has never yet been properly prospected.

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WHILE all laccoliths are not known to be associated with ore deposits, yet this form of geological occurrence has come to be regarded as affording possibilities that should be inquired into wherever found. So many valuable mines and extensive mining districts occur, in Colorado, Nevada, South Dakota, Utah and elsewhere, in association with laccolithic intrusions, that it is now considered necessary to investigate the contact of laccolitic rocks with the surrounding sedimentary formations which they intrude. Even in mineral districts, all laccoliths are not associated with ore bodies.

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THE cost of hydraulic mining depends wholly upon the conditions under which the work is done. The important factors are character, quantity and condition of the gravel, amount and head of water available for hydraulicking, grade obtainable to render disposition of tailings inexpensive, percentage and size of boulders encountered, ability and experience of the management, and interest on capital invested in property. In California, hydraulicking has been accomplished as low as 4c. per cu. yd., but it is usually as high as 6 to 8c. per cubic yard.

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THE secondary enrichment of mineral veins and ore deposits is not equally pronounced in every district. It seems most commonly to occur in connection with copper and lead ore. Pockets (accumulations) of gold in veins and intersecting seams in rocks, such as occur in scores of places in California, are probably the result of secondary enrichment, or localization of mineral deposition. Some veins producing rich bunches or pockets of gold carry little or no gold a short distance away from the rich segregation. Other pocket veins carry a low grade of gold rock in shoots, the same as gold-bearing veins generally, the pockets being incidental.

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THE occurrence of manganese dioxide in the superficial portions of veins can usually be attributed to the presence of the sulphide of manganese (alabandite) in greater depth, though the carbonate and silicate may only be found, the sulphide being at either too great a depth or occurring in such small amount as to escape attention. In the Tombstone district of Arizona large quantities of manganese were found in the upper portions of some of the more prominent veins, notably in the Lucky Cuss and Knoxville mines. On the 350 level of the Lucky Cuss was found a large mass of ore rich in alabandite and associated with pyrite and galena.

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SOME conclusions have been reached concerning the deposition of ores in veins, which may be generalized as follows: "Ascending hot-spring waters, if metalliferous, may deposit different ores with a certain order of vertical distribution. Ascending hot alkaline waters passing through brecciated zones, or crushed and re-opened veins containing pyrite, re-act with the iron sulphide, and zinc, lead, copper and silver, if present, are precipitated as sulphide. Ascending hot acid waters may leach the lower levels of re-opened veins, and carrying the minerals to higher levels deposit gold, silver and copper upon cooling, in the upper portion of the vein.

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PRECIOUS opals occur throughout the world wherever found, in volcanic rocks, usually trachyte. The play of iridescent colors is due to internal fractures in the mineral and the consequent interference of light rays. Ordinary opal and semi-opal occurs in various eruptive ks and in veins, also in tuffs. This variety does not sub the play of colors so much prized in the so-called that a Some opals lose their brilliant display of that ar continued exposure, but in some varieties this that are mporarily restored by immersing for a time in that mu When the stone again grows dim, it is against d in oil. This peculiarity is attributed to some selves, bi als. they will

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the first d arble found near Mayer, Yavapai county, among the posit of calcareous travertine (aragonite) always under springs, which have long since ceased

To present posit covered about 85 acres of land, show how nat ly a remnant of a once much larger give below a s ter portion of which has been removed onyx occurs in banded shades of red, chocolate, yellow, white and black, and a portion of it—the more highly prized, delicate apple green—with red veinlets and markings. The deposit is in part underlain by conglomerate, which in turn rests upon the upturned schists of Paleozoic or, possibly, pre-Cambrian age. The onyx deposit is of recent formation.

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THEORETICALLY, the quantity of ore which may be crushed by rolls is proportional to the superficial surface passing per minute. A set of rolls known to crush a certain quantity of ore at a stated speed would then be calculated to crush double this amount if the peripheral speed be doubled. In practice, however, this is known to be a fallacy, for rolls running at very high speed on some ores give lower capacity than that obtained at a proper speed. When running at very high speed the rolls cause hard rocks to rebound, interfering with the feed and reducing the capacity of the machine. Tests should be made on various ores with a view to ascertaining the proper speed of the rolls for that particular ore. More important than high speed is the keeping the faces of the rolls true and the roll shafts level, avoiding grooves, and the wearing of the side plates. It is not economy to feed the ore in coarse lumps, even if the rolls will crush them. Rolls are not for rock-breaking purposes, but for pulverizing after the ore has been broken to proper size by the breaker.

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BLUESTONE (copper sulphate) is recovered in electrolytic copper process from the electrolyte by first boiling the solution in lead-lined tanks with cement copper, in the presence of steam and air, for the purpose of neutralizing any free acid present and to increase the percentage of copper present to the amount desired. It is then conveyed to the tanks, where the copper sulphate crystallizes out on strips of lead suspended in the saturated solution. The liquor remaining contains the greater part of the antimony and arsenic which may have been present in the electrolyte and a small amount of copper. The latter is recovered later in other tanks by precipitation on sheets of iron. The copper precipitates in these tanks first, and later the arsenic is thrown down. In some works the mother liquor remaining after recovery of the greater part of the bluestone is concentrated by evaporation, to crystallize out the remainder of the copper sulphate and the arsenious acid. The bluestone is then leached out with an amount of water just sufficient to dissolve it without dissolving the arsenious acid, or iron sulphate. These latter are recovered from the liquor remaining after the last of the copper sulphate has been secured.

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THERE is a difference of opinion as to the relative merit of flat and inclined bottoms in mill ore bins. Those who favor the flat bin claim that the rock (either ore or waste) on the bottom protects the bin from wear and tear of the floor, and gives the mill structure steadiness. Those favoring the inclined bottom merely say it saves shoveling. That the flat bin really possesses an advantage is not apparent. If the mill is well constructed the several tons' weight of ore in the flat bin is not required. If the mill is not properly braced the presence of this additional weight in the bin gives it no steadiness, but rather increases the effect of the vibrations imparted to the structure by moving machinery. When ore runs low, and the reserve in the bottom of the flat bin must be drawn upon, shoveling is at once necessary, and the bin cannot be emptied at a cost of less than 15c. per ton for all that is accumulated there—a serious offset to the contemplated economy. In the inclined bin, if the ore supply is sufficiently abundant to keep the crushing machinery supplied, the wear and tear on the bottom of the bin is *nil*, and there is consequently no advantage of further protection of broken ore. Particular care should be taken in all mills to keep the bins constantly dry, for, if subjected to alternations of moisture and dryness, the planks and timbers will quickly rot and a large bill of repairs will have to be charged to mill account.

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INTRUSIVE DIKES associated with veins often have an important influence on their value, particularly where the dike is older than the vein. When later, it often appears only as an accompaniment, being found on one side or the other of the vein and sometimes crossing from side to side, and leaving the vein altogether, running parallel with the vein, but several feet distant. Such dikes generally seem to have had no enriching effect upon the vein. A dike older than the vein, however, in many places appears to have had a favorable influence on ore deposition, if not being wholly responsible for it. The quartz or other gangue material of the vein may be independent of the dike rock, or the dike itself may have become silicified and mineral-bearing, in a mining sense. In some places two dikes may be seen side by side, as in the Greek mine in Calaveras county, Cal., where a gold-bearing quartz vein is found accompanied by a light-colored felsitic dike and a dark-green diorite dike. In the Monte Negras district, near Dale, Riverside county, Cal., gold-bearing quartz veins occur in a large diorite formation, unaccompanied by dikes. Other veins in the district are seen at contact of the massive rock and dikes of a later, darker colored diorite, and in still other instances the veins occur wholly within the dark-green aphanitic diorite dikes. Throughout this district, over an area of several square miles, the veins are similar, consisting principally of quartz and carrying iron, lead, copper and zinc sulphides, with gold and silver.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

MINING ENGINEERS AND GEOLOGISTS.

The Editor:

Sir—I have read with interest the letter of Mr. Forbes Rickard, under the above caption, in your issue of the 6th inst. I see no good reason for "strained relations" between geologist and mining engineer, or why the gentlemen representing one class should feel superior to the other. The student cannot get his degree as mining engineer without having had liberal instruction in geology, and particularly in that branch of the science known as mining geology. The value of geology in mining is appreciated by every mining engineer, and still the fact remains that mines were *extensively and successfully* operated long prior to the advent of the mining geologist as a prominent factor in mining operations. Some of the greatest mines of the world were discovered, developed, equipped and practically worked out before the modern mining geologist ever saw them, and then he was so slow in expressing an opinion for fear of making a mistake that his theories were of little value. In more recent years, however, the geologist has been somewhat more confident, and has been known on occasion to announce his judgment rather prematurely.

Notwithstanding this, a high valuation is placed on the opinions of those who are recognized as expert in matters geological. This is clearly evidenced in any mining lawsuit where an extensive array of scientific talent is found on either side, giving expression to their pet theories in return for a handsome retainer. The remarkable thing about it is that these men, who are recognized *by their friends* as at the top of the profession, find it so hard to harmonize their theories. If there is really much of importance in the judgment of expert mining geologists, it is strange that these opinions are so much at variance. It must be remembered, however, that these are judgments of things which usually cannot be seen or determined positively—merely theories concerning the origin of veins or deposits, geologic relations, and other uncertainties, and consequently they must be allowed some latitude.

Why the man who has made mining geology a specialty should feel or assume a supercilious disregard for the opinions of the practical mining engineer is not apparent.

In a famous lawsuit a noted geologist testified that the ore deposits of two adjacent mines, separated only by a narrow gulch, had nothing in common and never had had, in fact, were wholly different in genesis, and he attempted to substantiate this statement by pointing to the fact that in one of the mines in question crystals of wulfenite were found, whereas they had never been observed in the other. The geological structure was so simple, and the previous probable connection of the ore bodies on opposite sides of the gulch was so apparent to the veriest novice in geological science, that those who heard could not but believe that in all probability this remarkable opinion represented a large fee.

The mining engineer is brought into daily contact with material matters. He deals with costs and results, and naturally drifts away from purely scientific considerations. Should his ore-shoot pinch out or the orebody otherwise disappear, he usually wastes little time in theorizing on possibilities, but at once sinks his shaft and inaugurates a new campaign of investigation and development. Theories are all very well when the mine is in bonanza and paying handsomely, but when conditions change for the worse it is generally the practical engineer and not the scientific geologist who is wanted. But there are important exceptions. In the history of some mines a time arrives when the practical miner comes up against a solid 'dead wall,' and he is at a loss to know which way to turn. A notable instance was that in the once famous Emma mine, in Little Cottonwood canyon, in Utah. The great mass of rich lead-silver ore which had attracted the attention of the entire mining world, suddenly terminated against a face of barren limestone; and only a few months after the superintendent had publicly announced with unmistakable pride that the great orebody was "practicably inexhaustible, and the removal of a thousand tons per day made little impression on it," the mine was worked out. Limestone formed the hanging wall, limestone lay beneath the orebody, and now limestone "stared them in the face" in the stope. A mining geologist came to the rescue, and after careful examination of the limestone surrounding the great cavern, which had once been a mass of ore, determined that the limestone in the face was younger than that in the foot-wall of the orebody, and consequently there had been a displacement, the line of fault cutting off the orebody. He ventured the opinion that the continuation of the ore would be found lower down, which proved to be correct.

Were a case similar to this to arise to-day, the probability is that there would be no stoppage of mining, or, at least, no more than a temporary cessation of stoping, for any mining engineer would be equal to so simple an emergency.

The mining geologists have done a great work at Leadville, Colorado, after the necessary exposures had been made under direction of mining engineers, but in the development and exploitation of these famous mines, mechanical problems have been met and solved "time and again" by mining engineers—problems which would have worried the geologist far more than any geological disturbance worries the mining engineer.

Surely, in the broad field of economic and scientific mining, there is a place for both the mining geologist and mining engineer. Each, if he conscientiously discharges the duties of his chosen branch of the profession, must win success and the justly earned respect of his peers.

W. H. STORMS.

San Francisco, January 8, 1906.

ELECTRICITY VS COMPRESSED AIR FOR MINE OPERATIONS.

The Editor:

Sir—In your issue of January 6, there appeared an article by W. R. Hulbert, who presented the advantages of electricity over compressed air for mining purposes. It is claimed that electricity is cheaper to produce, especially at a high altitude, that the transmission losses are less than in an air plant; that the dangers and expenses attending the uses of compressed air are great and that electricity has the decided advantage of being serviceable for the purpose of lighting. It is my purpose to refute these arguments.

Of course, it is well known that when two or more systems are available for accomplishing an end, each system has certain advantages not possible in the other. Such is also the case with the electrical and compressed-air systems. Regarding the first cost or the cost of installation, the advantages are much in favor of compressed air. As far as boilers and engines are concerned, each system calls for about the same investment; the equality of cost stops at this point. It is well known that the cost of installing a dynamo is greater per horse-power than for installing a compressor, and as the units decrease in size the first investment per horse-power increases, and, furthermore, the price of alternating current machines is in excess of that of direct-current generators.

If an alternating current is used and, if the current must be sent some distance, transformers are necessary at either end of the line, and, if direct current must be the working fluid at the tools, a converter is needed. It is thus seen that the number of units which comprise an electrical system are great and that as the number of units increases the investment cost must correspondingly increase. The advantage is, therefore, much in favor of the simple compressed air system. The latter requires for its economical operation a compressor, a good pipe-line and only one possible accessory in the form of a re-heater.

As the number of parts of a system of generation increases, the cost of maintenance and repairs increases also. Interest and depreciation, likewise, are important factors.

Altitude compression, due to the more rarefied conditions of the atmosphere, is accompanied by a slight increase in horse-power over that necessary at sea-level to produce the same results at the tool. This calls for the employment of a somewhat larger compressor. Even the additional cost of this larger machine still leaves much, as far as the costs of installation are concerned, to the advantage of a compressed-air system.

Beginning with a steam engine, is it cheaper to produce electricity or compressed air for mine operations? Taking the available energy in the steam engine as unity for both systems, we find that in transforming the work into electrical current at a certain potential there is an attendant loss of about 10%, under good conditions; these losses are due to friction, hysteresis and magnetization. It is granted that the energy gotten out of a compressor is less than that secured from a dynamo, but the difference is slight. The losses in the compressor are due to both the friction of parts and to the thermodynamic requirements. The latter loss arises from the fact that compression under pure isothermal conditions is impossible. Since the jacket water cannot remove the heat generated by compression as quickly as the ideal would warrant, actual compression lies between the isothermal and the adiabatic. These losses decrease more and more as the number of stages for compressing the air is augmented. At the power station have the advantage in favor of compressed this point a re-heater may be employed very slight additional cost for fuel, the energy air may be so materially increased as to advantage of electricity, leaving much the credit of compressed air.

Transmitting any energy necessitates trical current flowing over a conductor sarily decrease in intensity as the distance power station becomes greater. The directly upon the quantity of current through the conductor and also upon diameter and quality of the wire.

friction or resistance increases directly with the square of the current and directly with the length of the line. Resistance varies with the length of conductor and inversely as the diameter. To diminish, therefore, the watts lost in friction, either the current or the length of line must be decreased or the area of the wire increased; the first two conditions are impossible, since the machine to be operated must have, and will call for, a required operative current, and since the length of line depends upon the distance of the power-house station from the work, the only alternative left open to us is to increase the diameter of the conductor. Those who are at all familiar with copper costs can readily appreciate the great expense that this would entail. In fact, there are instances where electrical energy is transmitted some distance under moderate voltage, in which combined costs of the copper, poles and porcelain insulators were almost as great as that of the installation of the power plant proper. Of course, the resistance losses due to transmission may be decreased by sending power over the line at high voltage. This calls for alternating current, that the generated energy may be transformed at the power station to a current at high potential.

As the potential at the power station is increased, and since the products of the volts and amperes must be constant, the current must decrease. A transformer accomplishes this, giving a light current flowing at high potential attended with slight losses. These losses may be increased to reduce the copper cost by decreasing the diameter of the conductor and increasing the resistance of the line. In fact, with an alternating current we may secure with thin wire a copper loss no greater than that gotten with best conditions when employing direct current, but the use of alternating current necessitates the introduction of extra machines. We generate at the power station alternating current at normal voltage; this is raised by a 'step-up' transformer which has an efficiency of about 90% to 95%; the current at high potential is sent along the line with small copper losses until it reaches the place of application. At this point a 'step-down' transformer must be employed with its attending losses to bring the voltage to a safe amount for operative purposes. If the electrical tools call for direct current, as is generally the case, a rotary converter is needed to transform the current from alternating to direct. This transformation necessitates a considerable loss.

In transmitting compressed air we find different laws governing the losses. As the air flows through the pipes, the resistance of the inner surfaces must be overcome and this gives rise to a slight drop in pressure. Compressed air differs from electricity especially in the fact that electrical friction losses cannot be regained, while corresponding losses with compressed air may be eliminated. The moderate fall in pressure in the air due to friction augments the volume of air and does not involve a loss of transmission. As my friend, Mr. W. L. Saunders, has stated it: "If the air were at 80-lb. gauge or 95-lb. absolute upon entering the pipe and 70-lb. gauge or 85-lb. absolute at the other end, there would be a loss of a little more than 10% in absolute pressure, but at the same time there would be an increase of volume of 11% to compensate for this loss of pressure and the loss of available power would be less than three per cent." At the point of application of the air, the initial energy may be restored by adding a slight amount of heat to the air; in fact, the employment of a re-heater increases the volume to such an extent that additional energy is obtained when air is used expansively at the rate of *one horse power per pound of coal.*

In mine operations, not to interfere with the comfort and health of the men, the re-heater is never pushed for all that it is worth. Compressed air is only raised in temperature slightly, to make up for the transmission drop in pressure. Thus it is apparent that the loss of energy in transmitting air is nil; even when a re-heater is not used, the drop in pressure and the loss of energy are slight as compared with electrical transmission losses.

Electricity has the inherent difficulty-danger to the operator. The insulation may be defective and the effect of [illegible]ck may prove fatal. Where electricity is e[illegible]ed for mine haulage, a third rail or live wire is[illegible]and the [illegible]and, for apparent reasons, no insulation[illegible] the base [illegible]used; the only safeguard possible [illegible]ity, or the pow[illegible]"Danger! Don't Touch the Wi[illegible]other words, the [illegible]ntee from accident is a mere [illegible]manence of a species [illegible]live wires touched unintenor of a State depends o[illegible]the risk in the low headings [illegible]tion to its surrounding [illegible]ted warnings be of service

The evanescent type [illegible], especially those of foreign [illegible]preserved for us, fossilize[illegible]anything should happen to [illegible]evanescent form of Governors used on the cars or [illegible]ten records or in the customs [illegible]hem to become inop[illegible]the physicist has to pursue has[illegible]wever, there is enout such useful hints as to the pavers to permit the

The fascinating idea that matter[illegible]he risk attending common substratum is of remote [illegible]a mine is obvious. middle ages the alchemists, inspire[illegible]curred in mines conceived the possibility of transfor[illegible] metals into gold. The sole difficulty [illegible]seclude the use the discovery of an appropriate ser[illegible]l mining con- operations. We now know that they [illegible]wed it may be definitely far from the goal of their sear[illegible]t ignorant, the com-

pressed-air line assists ventilation as do exhausts from all the tools; it reduces the effect of poisonous gases and dilutes or expels the smoky products of blasts.

The ventilation secured from compressed air is of itself an extremely costly process. As a matter of fact, however, no expense at all is involved, as the ventilation is obtained gratis from a waste. There is an instance on record where the exhaust air was of a noxious character; this was due undoubtedly to the bad practice of employing a poor lubricating oil in the compressor cylinder. Of course, such conditions should be guarded against; they are apparently so rare as to cause no alarm.

Electricity has one undoubted advantage over compressed air; it may be employed for lighting a mine. But who needs light throughout? Few lights are necessary, and those only at certain points. Were electricity employed for lighting purposes it would, nevertheless, be the best practice to have the lighting system independent of the power system, so that the lines may be intact in cases of emergency. As a matter of safety, the old form of miners' lamp has the advantage. Explosions are impossible and the light is always with the operator just where needed.

Electricity has advantages which are possible with no other form of energy, but for mining purposes compressed air far surpasses it as a driving fluid. Were the cost of installation, generation and transmission of compressed air greater than that for the electrical system, the facts of the danger in employing electricity should certainly preclude its use. Compressed air stands alone in this field of operation. It is cheap, reliable, safe and effective.

EDWARD F. SCHAEFER.

New York, January 10, 1906.

USE OF COPPER IN CHINA.—The copper trade was stimulated last year by the purchases made on Chinese account, some 45,000 tons of the metal having been shipped from this country to China. Most of this was for the manufacture of *cash*, a small coin in general use among the natives. Mints were established for this coinage, there being profit in the indiscriminate manufacture of alloys of copper with baser metals. This has upset monetary conditions in China, as is testified by the vice-consul at Hangchau, who says: "Already several viceroys and governors of the Empire have issued proclamations forbidding the importation of these copper coins into their respective provinces. Nevertheless the various provincial mints continue to run at full blast, turning out millions of these cheap coins every 24 hours, and forcing the people to accept them. In Hangchau there are two such mints, and the daily output is something like 1,500,000 of copper coins. These coins are nominally worth 10 cash. One year ago they were sold by the mints at the rate of 90 coins to one Mexican dollar. At present, however, the same coins can be bought at the rate of 98 to 105 for one Mexican dollar. The best of these coins, while selling normally for 10 cash each, are intrinsically worth only six to six and one-half cash, while there is a huge quantity being forced into circulation by the provincial authorities through local banks that are worth only three to five cash each. A new mint established in Hangchau last May has been for five months past dumping coins of this latter kind upon the merchants of the city at the rate of 200,000 per diem. The results of this sudden inflation of the circulating medium have been to drive the old genuine copper cash almost entirely out of circulation; to raise the price of nearly all kinds of foodstuffs and of fuel; to cheapen the copper coins themselves, owing to their plenitude, and to arouse general discontent among the masses of the people. The old copper cash, although grimy, bulky, and inconvenient to handle, has been the circulating medium among the Chinese for all minor business transactions for many hundreds of years, and to this the people are greatly attached. These old coins represent real value—many of them being composed of pure copper, and some even containing a little gold. And as a vast majority of the articles used in every-day life are bought for a few cash each, oftentimes for less than 10 cash, it is obvious that to replace these old coins with coins of no less than 10 cash value would not only cause the poorer classes great inconvenience, but in a multitude of cases an actual loss."

INCREASED USE OF CEMENT in building construction has caused an extraordinary increase in the production of this material. Although the manufacture of portland cement only began in 1875, and in 1889 the annual output had a value of only $500,000, in 1903 it had grown to $27,713,319. In 1904 the production in the United States was 26,505,881 bbl., valued at $23,355,119. Of this amount Pennsylvania produced 11,496,099 bbl. and California 1,014,558 barrels.

DELIVERY of the MINING AND SCIENTIFIC PREES to local subscribers was delayed last week by a cause beyond our control. We hold an official receipt proving that papers were received at the San Francisco Post Office at 2:20 p. m. on Friday. The delay in delivery is due, we understand, to a shortage in distributors caused by the demand upon the San Francisco Post Office for expert men to work on the new fast mail across the continent.

Mining Costs—A Suggestion.

Written for the MINING AND SCIENTIFIC PRESS by R. GILMAN BROWN.

Of late years it has been more than once urged that both logically and practically the fundamental basis for a segregation of mining expenditures should distingush between those that vary with tonnage and those that do not. In general the second division is used to cover administration and kindred matters; actually, each department has a large group of costs that bears about the same relation to the rest of that department that administration costs do to the other departments.

It is only when this fact is clearly recognized that the full weight of the argument in favor of the above segregation is felt; for instance, the mine foremen, pumpmen and hoist-engineers represent a practically constant expense; the same is true of the regular mill force; they are a fixed charge, just as much so as are office expenses and the superintendent's salary. It follows that segregation on these broad lines is of practical importance to the engineer and affords him a simple escape from the 'per ton' or 'unit cost' figures, which for this class of expenditure serve a doubtful end. When dividing totals by a variable tonnage to get the unit of cost, the fact that they should be nearly constant is forgotten, and if they chance to vary beyond a reasonable limit this fact is obscured by the introduction of another variable factor, the tonnage, so that an actual and perhaps unwarrantable increase may, in per ton figures, appear as a decrease. Nor must it be forgotten that this difference in the bearing of accounts is fundamental, and that even if a segregation that does not show it is used, hidden somewhere in the accounts, these fixed expenses exist and will make themselves felt by anomalies in per ton costs, that the careful manager will have to ferret out by perplexing side calculations, and that the every-day surface-of-things man will never think of or take the trouble to investigate. Impressed deeply by these considerations, it has become my custom to subdivide all department accounts on these lines and the method has so distinctly 'made good' that I do not hesitate to suggest it to others as worthy of adoption.

To one seriously considering this segregation, it will become apparent that with merely the two broad divisions there are certain expenditures that are intermediate; some are far from being fixed and yet they depend in no degree upon tonnage; others do, in a certain way, depend upon tonnage, but cannot be considered as proportional to it. In this borderland almost any number of classes can be made, but it is of the first practical importance that they be as few as possible to attain the end; in deciding upon their number the object of the whole classification must be kept clearly in view; the ideal must give way to the practical, and it is precisely on the score of practicality that this system is urged.

Personally, I prefer to divide all classes of expenditure into: Those that are independent of tonnage, subdivided into 'fixed' and 'variable'; and those that are dependent on tonnage, subdivided into those that are directly or proportionately and those that are indirectly dependent. Capital expenditures, that must be redeemed in some way by charges against operating accounts, form a class by themselves, but as they are written off at fixed periods they will appear among the 'variable' accounts of the first division; in certain cases they may belong among the 'fixed.' As construction is, in general, always under way, this will be the exception.

To present the matter in its simplest form and to show how naturally this method works itself out, I give below a summary of the mine cost-sheet for the month of October, 1905, of the Standard mine at Bodie, California. The letters over the first four columns are the initials of the main divisions of accounts: 'Fixed,' 'Variable,' 'Dependent' and 'Independent.'

With this before us it is clear, for instance, that the per ton figure of $1.534 for general labor means nothing definite, because three kinds of labor are included in it; it can only be used rightly for forecasting the costs in months where the tonnage is 1,931. And yet in any system that does not differentiate between the different classes of expenditure, this amount would be used in estimates and comparisons with the reliance we are so apt to place upon figures that have the appearance of exactness. For the tonnage given, the costs sum up to $5.40 per ton and the D. & I. accounts come to $4.10. In case of a smaller tonnage, say 1,500, as in November, the estimate would be as follows, which is obviously a more dependable figure than the total per ton cost of October:

F. & V. accounts, $2,525.32 ÷ 1,500	$1 68
D. & I. as before	4 10
Total	$5 78

Another point is brought out by the above example, namely, that segregation on this fundamental principle does not prevent a dissection of accounts into as small items as may be desired, so that all that is sought for in other systems is retained in this, and in addition other facts, which, as shown above' are of no small value to the engineer.

ACCOUNT.	F.	V.	D.	I.	Total.	Per Ton F. V. D. I.	Per Ton D. & I.
General Labor	$1,678 00	$248 00	$1,035 50	.....	$2,961 50	$1 534	$0 536
Ore Transportation	124 00	.....	.....	.....	124 00	064	.....
Development	.....	.....	.....	$2,237 05	2,237 05	1 158	1 158
Stoping	.....	.....	4,234 68	.....	4,234 68	2 192	2 192
Distribution Accounts	330 88	144 44	287 70	122 99	886 01	459	213
Total	$2,132 88	$392 44	$5,557 88	$2,360 04	$10,443 24	$5 407	$4 099

Tonnage for month, 1,931.

As tending to further make clear the principles involved, I give another example in a cost-sheet from a small California mine. This is still a summary, although it shows a greater degree of segregation than the first; it also covers all the operations and not a single department:

In this case, while the total unit-cost for the month is $4.48, had the tonnage been 2,000 it would have been $4.15, as is shown by the following:

ACCOUNT.	F.	V.	D.	I.	Total.	Per Ton F. V. D. I.	Per Ton D. & I.
Mine—							
General Labor	$479 44	.....	.....	.....	$479 44	$0 313	.....
Stoping	.....	.....	$1,639 17	.....	1,639 17	1 069	$1 069
Development	.....	.....	.....	$1,690 57	1,690 57	1 103	1 103
Filling	.....	.....	298 16	.....	298 16	0 195	0 195
Miscellaneous Supplies	.....	.....	.....	203 40	203 40	0 133	0 133
Fuel	.....	.....	322 17	.....	322 17	0 210	0 210
Expense	.....	.....	.....	266 77	266 77	0 174	0 174
Mill—							
Labor	410 60	.....	.....	.....	410 60	0 268	.....
Power	240 00	.....	.....	.....	240 00	0 1157	.....
Supplies	.....	.....	155 52	.....	155 52	0 102	0 102
Ore Transport	147 50	.....	17 08	.....	164 58	0 107	0 011
Distribution Accounts—							
Shops	340 10	.....	.....	23 67	363 77	0 237	0 015
Assay-office	90 00	.....	.....	19 94	109 94	0 072	0 013
Water-power	.....	.....	.....	27 75	27 75	0 018	0 018
General Accounts—							
Administration	264 30	.....	.....	.....	264 30	0 173	.....
Miscellaneous	109 98	$108 66	.....	15 68	234 32	0 153	0 010
Total	$2,081 92	$108 66	$2,432 10	$2,247 78	$6,870 46	$4 484	$3 053

Tonnage, 1,532

F. & V. accounts, $2190 58 ÷ 2,000	$1 095
D. & I. accounts	3 053
Total	$4.148

In the two above examples, both F. & V. accounts and D. & I. accounts are treated together, but it introduces no complication, and it is at times advisable to consider them apart. The 'fixed' should be practically constant, so that any material change in their total at once sets one in search of the cause; the 'variable' will ordinarily swing between certain limits, and if these are exceeded but a few accounts need be searched. The reason for changes in the unit figures of the 'directly dependent,' if it does not lie in changed physical conditions, or cost of labor or supplies, involves the personnel of the force; while the 'indirectly dependent,' being non-proportional functions of tonnage, will owe their per-ton changes to other causes, which a more extended dissection should show. It follows then that, in general, this last division will demand more itemization than the others. The degree of this in the full cost-sheets, of which the above are but summaries, is one of those details that can only be settled by consideration of the local conditions and needs.

In conclusion, it is believed to have been shown that by the adoption of these basal divisions and the abandonment of unit-costs for expenditures that are independent of tonnage, the work of the mine can be more easily and closely watched, and reliable forecasts for altering conditions be more quickly made.

THE discoveries of banket in Rhodesia, announced a year ago, are affording evidence of value. In El Dorado mine there is four feet of 2½-oz. stuff at a depth of 120 ft., and other openings show from one to four ounces gold ore. E. H. Garthwaite, a Californian, is in charge of these explorations.

Copper Refining.

By LAWRENCE ADDICKS.

In refining copper by the electrolytic method high-grade anodes are universally used in America. Usual compositions are:

Copper	98 to 99.5	per cent.
Silver	0 to 300	oz. per ton.
Gold	0 to 40	oz. per ton.
Arsenic	0 to 2	per cent.

Small amounts of antimony, bismuth, iron, nickel, sulphur, selenium, tellurium and silicon.

Impurities with soluble sulphates go entirely into solution and grow cumulatively. Selenium and tellurium and the precious metals go entirely into the slime. We have, therefore, a triple separation. The usual products are only copper at the cathode, silver and gold from the slime, and sometimes copper and nickel sulphates from the electrolyte. Selenium and tellurium, especially the latter, are easily recoverable from the slime, were there sufficient market. Tellurium is an element almost without use in the arts. Small amounts are used in medinine, but the output of one of our copper refineries for one day would stock a large chemical supply house with tellurium enough to last a year. Arsenic, antimony and bismuth go partly into solution, partly into the slime, depending on the nature of the form of combination in which they exist in the anode and various secondary reactions taking place in the electrolyte.

Arsenic is the most difficult impurity with which to deal. If much is present in the anode, say over 1%, it rapidly grows in the solution and necessitates a large expenditure for purifying to hold it down. With small quantities it seems to slime more rapidly and no purifying at all is necessary. With other conditions properly cared for, satisfactory cathodes can be produced in an electrolyte running 2% arsenic, though this is considerably above the customary figure.

The purification of solutions is almost always done by working up a certain quantity regularly into bluestone and adding fresh acid to the electrolyte. If the purification requirement is heavy the bluestone department becomes disproportionately large, and consequently copper running high in arsenic is most unwelcome. Antimony and bismuth are seldom present in sufficient quantity to cause trouble. Various chemical methods of purification have been tried with the object of regenerating the electrolyte and returning it to the circulation, but there are few substances that will precipitate arsenic in an acid solution, and further the action of such reagents does not seem reliable, probably due to differences in form of arsenic compounds present at different times.

The insoluble anode slime from which the gold and silver are recovered is very variable in composition, as might be expected, depending on the grade of material being handled. It is chiefly metallic in nature and a common composition would be as follows:

	Per Cent.
Silver	40
Gold	2
Copper	25
Selenium and tellurium	5
Arsenic and antimony	10
Lead, silica, sulphuric acid, etc	18

The presence of so much copper in the slime is objectionable in the silver refinery process and must be removed before cupelling the dried slime to avoid making rich slag. The other impurities give but little trouble, except possibly tellurium, which requires prolonged furnace treatment to burn it off.

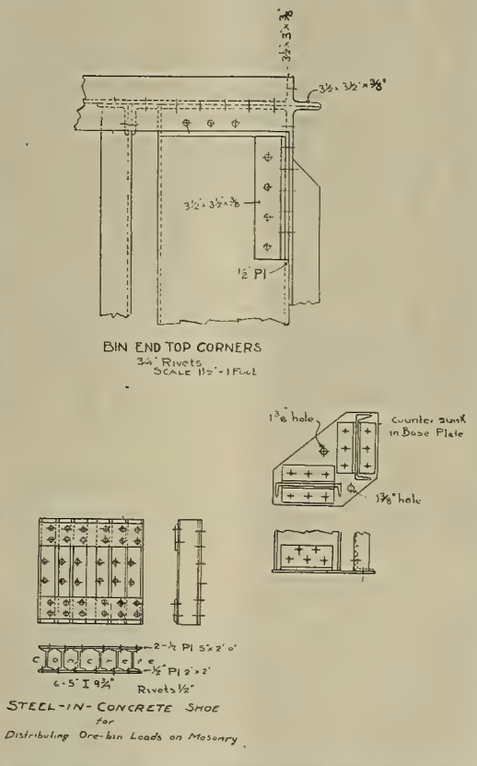
The cathode copper is exceedingly pure, usually running about 99.93% copper, with hydrogen as the chief impurity. Objectionable cathode impurities are of two classes—those which depress the electrical conductivity and those which make the metal brittle. Arsenic and antimony represent the first class; tellurium and lead the second. Good cathode copper should show but a few thousandths of a per cent of arsenic and antimony. Experiments have indicated that it takes but 0.0013% of arsenic or 0.0071% of antimony to lower the conductivity 1%. A third class of cathode impurity concerns the refiner, comprising silver and gold. Cathodes usually show from one-tenth to one ounce of silver and a trace of gold. This seems to be due entirely to the mechanical fouling of the cathode by particles of anode slime. In fact, it is a question if most of the arsenic and antimony found in the cathodes do not have a similar origin. The slime is very finely divided and the continual circulation of electrolyte necessary to prevent polarization maintains a very slight turbidity. These particles are probably electrostatically attracted to the cathode.*

AS A STRUCTURAL BUILDING MEMBER, re-enforced concrete shows an economical distribution of material. Steel is provided to take care of all direct tensional stresses and those shearing stresses for which the concrete is not sufficient. Compressive stresses are taken care of by the concrete. At least one-half the stress in a beam is provided for by the concrete whose unit cost is comparatively low. At one time it was supposed that the introduction of concrete would lessen the use of steel, but it has had the contrary effect. The reduced cost of concrete construction and the rapidity of working has stimulated building to an unprecedented extent.

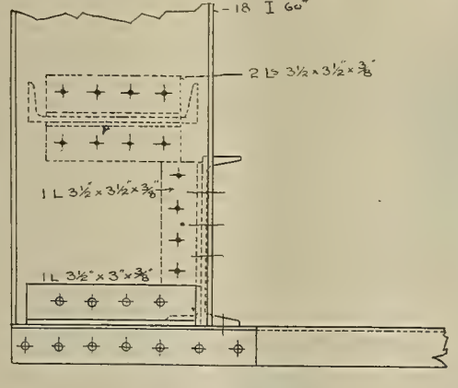
* Abstract from *Journal of the Franklin Institute*, December, 1905.

Steel Ore Bins.

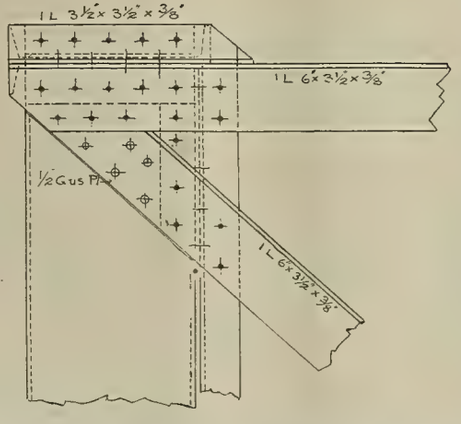
The accompanying drawings illustrate the construction adopted at the Bustos mill, at Guanajuato, certain featares of which were described in our last issue. The steel bins are supported on walls of masonry. The bin skeleton is of 15-in. channels



placed back-to-back in bents which are on approximately 6-ft. centers, the vertical channel posts being tied together at bin-floor level by two 15-in. channels, which are braced from the feet of the posts



Details of Steel Bins.

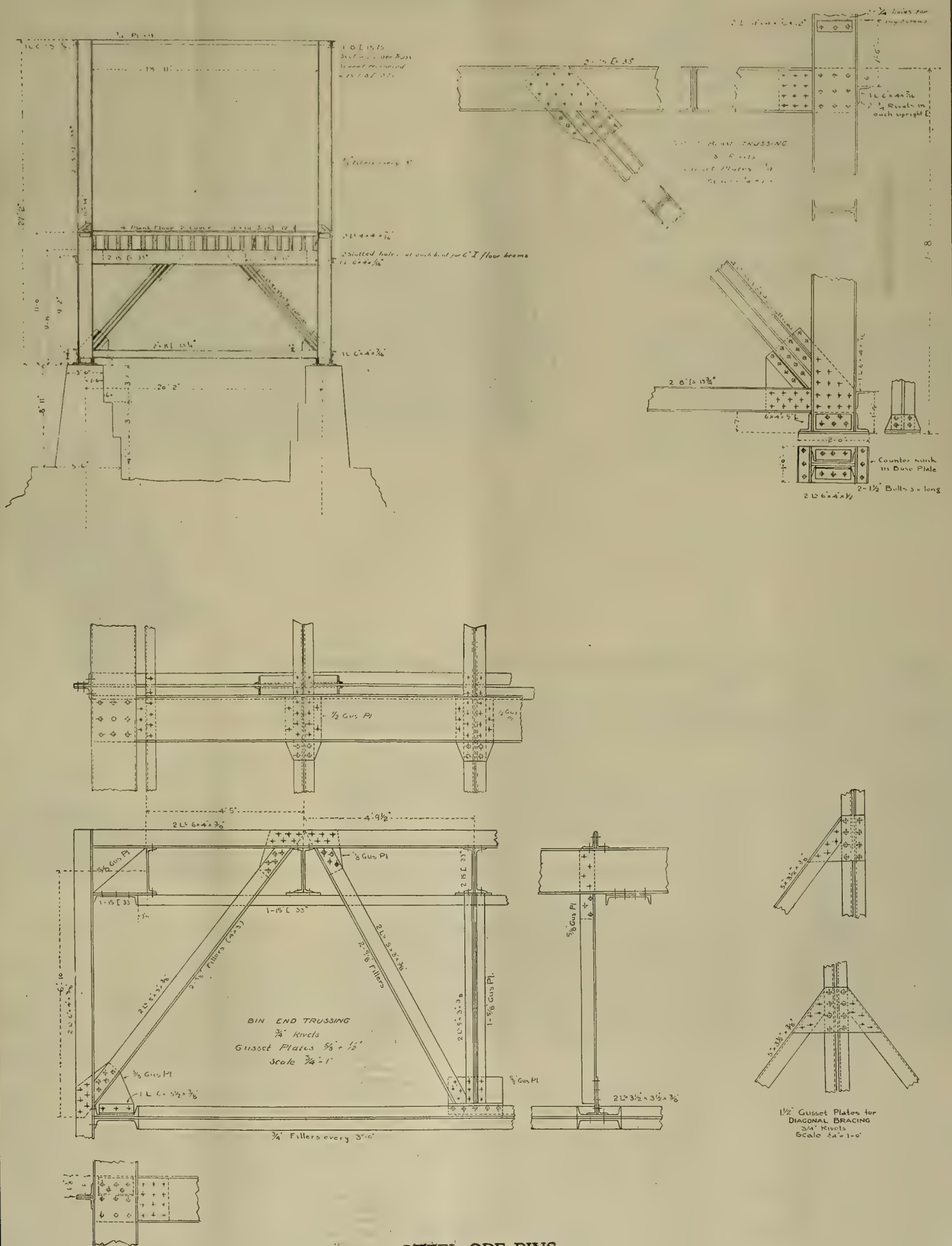


by inclined struts composed of four 5 by 3½ by ⅜ in. latticed angles. The thrust which these inclined struts carry to the feet of the posts is taken by two 8-in. channels acting as a tie between the feet of the posts, thus trussing the whole and converting the strains on the masonry into purely vertical strains. As the weight in the bin is very heavy—about 2,500 tons, exclusive of the bin itself—the feet of the columns are supported upon a grillage of six 5-in. I-beams, two feet long, held together by plates riveted to the tops and bottoms. This rests directly upon the masonry. These bents are braced together longitudinally at the top and floor-level of the bin by 8-in. channels and heavy angles; at the ends of the bin the outward thrust upon the bents is taken by a truss member at the top of the bin. The bents themselves are tied together at the top by ¾-in. plates 4 in. wide, riveted between the channel-beams to the posts. Within this skeleton is a lining of plank, 4 in. thick in the bottom courses with an inner sheathing of 2-in. plank with the grain vertical. The bin has a flat bottom supported on 4-in. by 14-in. joists on 12-in. centers, carried upon horizontal members of the steel bents before mentioned, on the top of which is laid a 3-in. plank floor covered by a 2-in. lining.

IT is proposed to transmit electric power from the Victoria Falls on the Zambesi, in central Africa, to Johannesburg, to be used at the mines of the Rand. It is expected that a total saving of $10,000,000 can be effected in the cost of motive power. Sir Charles Metcalfe, the organizer of the Cape to Cairo railroad, is credited with this grand idea of power transmission.

THE LARGEST AIR COMPRESSOR IN THE SOUTHWEST.—American copper mines are famed for the magnitude and completeness of their mining plants. The Michigan copper country has long held first place in the competition for large and costly compressed-air equipment. But a recent order placed with the Ingersoll-Rand Company, of New York, shows that the tendency toward centralization of air-power in large units is working into other fields. The management of the United Verde copper mine at Jerome, Arizona, has just contracted with the manufacturers mentioned above for a cross-compound condensing two-stage Corliss air compressor which, when installed, will be the largest compressor unit in Arizona and the Southwest. The order calls for a 48-in. stroke machine, with steam cylinders of 28 and 52 in. diam. and air-cylinders 44¼ and 26¼ in. Steam-cylinders are jacketed, with valves in the heads. The machine is to operate under 110 lb. steam-pressure and a vacuum of 20 in.; a high steam economy is guaranteed. The air-cylinders will be jacketed on heads and barrels and will be fitted with piston inlet air-valves. The compressor will run at 75 r. p. m. at which the piston displacement will be 6,060 cu. ft. of free air per minute. The air-pressure is to be 100 lb., and the altitude is about 5,500 ft. The United Verde is popularly known as one of the greatest copper mines in the world, and the ordering of this large compressor seems to indicate that its immense ore reserves are by no means exhausted.

CHEMICAL TEST FOR WOLFRAM.—As a tungstate of iron and manganese, it gives a gray, infusible mass on charcoal; with borax lead it gives a colorless beading in the oxidizing-flame; in reducing-flame it gives a yellow bead while hot, which changes to yellowish-brown when cold. With microcosmic salt it gives a colorless bead in the oxidizing-flame, while in the reducing-flame it is a dirty green when hot, and becomes blue on cooling; on the addition of iron it is blood-red. Wolfram, when present in small quantities, may be detected as follows: The sample is fused with about five times its weight of sodium carbonate, the mass extracted with water, and the tungstic acid precipitated in the form of a white powder by means of hydrochloric acid. This precipitate becomes yellow on boiling, and is insoluble in excess of the acid, but dissolves in ammonia. The solution after acidification gives a deep-brown coloration with potassium-ferrocyanide, and after some time a precipitate of the same color separates out. The solution, after adding the ammonia, gives a white precipitate with silver-nitrate and yellow stannous chloride. On acidification with hydrochloric acid and warming, the precipitate becomes a beautiful blue color, which is very characteristic. If wolfram is treated with strong sulphuric acid and some zinc added to the solution, the solution will have a deep-blue color. Wolfram is usually associated with tinstone, and for a long time the separation of the minerals was a matter of considerable difficulty. It is now effected by roasting the crushed minerals with carbonate of soda, by which means tungstate of soda is formed and the tin-ore can be separated. The tungstate of soda thus formed is used with starch for rendering light fabrics, such as muslin, uninflammable. It is also employed as a mordant by dyers; it is also used for hardening plaster of paris; and it is the chief source from which tungstic acid is derived. For the estimation of the quantity of wolfram present the best method is as follows: Take 10 gr. of the substance and boil for about an hour with 25 c.c. of pure hydrochloric acid, then add 5 c.c. of pure nitric acid; boil for half an hour, and then allow to stand about 12 hours. Dilute with an equal volume of water and filter. The iron and manganese are obtained in solution, while the silica and tungstic acid compose the residue (with, perhaps, tin). Collect the undissolved residue, filter and wash with dilute hydrochlorine, dissolve in warm ammonia, filter off the undissolved residue—silica and possible tin. Dilute the solution and evaporate to dryness in a weighted porcelain dish; when dry, ignite carefully till it assumes a uniform yellow color, cool, and weigh. The iron and manganese, etc., are then to be estimated.—*Mining Journal, London.*



STEEL ORE BINS.

An Important Decision.

Written for the MINING AND SCIENTIFIC PRESS by ALBERT BURCH.

On January 8 the United States Supreme Court finally disposed of two suits in equity involving questions of general interest to mining men. They were known to the parties interested as the Stemwinder and Bunker Hill 'extra-lateral right' suits, and in both cases the action of the Supreme Court was to deny writs of *certiorari*, while in the Stemwinder suit an appeal was also dismissed.

The Stemwinder suit was begun in 1902 in the Federal Court for the District of Idaho by the Bunker Hill & Sullivan Mining & Concentrating Company, complainant, against the Empire State Idaho Mining & Developing Company, respondent. The Bunker Hill suit was brought in 1901 in the same court by the same complainant against the same respondent together with the closely affiliated Last Chance and Shoshone Mining Companies, all of which have since been merged with other companies in the Federal Mining & Smelting Company, which is now the real party in interest.

The action of the Supreme Court not only confirms to the Bunker Hill Company title to valuable orebodies, but also decides some important legal questions.

Reference to Fig. 1 will aid in an understanding of the Stemwinder case. Of the claims shown therein, the only one owned by the complainant is the Stemwinder location, unpatented. The Emma and Last Chance claims, senior in title to the Stemwinder, were the patented property of the Last Chance Mining Company, not a party to this action; and all other claims were owned by the respondent and junior to the Stemwinder. The foot-wall of the vein at the surface has a course through the claims about as shown in the diagram, and its true strike is about N. 40° W. The dip is southwest at about 40°. This wall marks a strong persistent fissure, which cuts the quartzite beds of the country on both strike and dip, and is a sharp line of demarkation between the vein on the one side and the country rock on the other. From this strong fissure, subsidiary crevices extend long distances into the hanging-wall country, having, most commonly, the strike and, frequently, the dip, of the quartzite beds. This condition results in the formation of large orebodies at distances as great as 400 ft. horizontally from the foot-wall, or about 250 ft. measured at right angles to its plane, and to the deposition of small particles of galena in the less shattered rock even further away from the controlling fissure. Beyond this even the surface quartzite is often heavily stained by iron, a fact which was used as a basis for the contention of the respondent that the true lode is at least 1,500 ft. wide, and that therefore only a part of the width of the apex is covered by the Stemwinder claim. The Court held, however, in both this case and the Bunker Hill suit, that the hanging wall of the lode is a commercial one; defined by the limits of workable ore and therefore not distant more than about 250 ft. at right angles from the foot-wall. Thus, both walls cross the northerly and southerly lines of the Stemwinder location and extra-lateral rights were granted accordingly.

No claim was made to the orebodies between the planes I-J and K-L, bounding the adjudicated extra-lateral rights of the Last Chance claim, and the novel question was raised whether the rights of the Stemwinder claim should stop entirely at the plane K-L, or whether they should merely be suspended on that plane and resumed again beyond the plane I-J, as against the extra-lateral rights of the junior Viola and San Carlos claims and the rights arising from the surface ownership by the respondent of the Jersey Fraction, Skookum, Cariboo and other claims, which were not held by the Court to contain any portion of the apex. This novel question was decided by the Court in favor of the Stemwinder and it was awarded extra-lateral rights between its side-line and the line K-L and beyond the line I-J between the end-line plane R-Y of the amended location and the side-line plane N-X of the original location, the amended location having been made subsequent to the location of most of the respondent's claims. On appeal, this decision was upheld by the Circuit Court of Appeals and it remains undisturbed by the Supreme Court. It will also be observed that the lines of the Stemwinder location are laid on, and across, the prior Last Chance and Emma claims, and the complainant claimed the right to use the end-line, so placed, to define extra-lateral rights not in conflict with those of the Emma and Last Chance. While this was not entirely a new question, it is interesting; and in ruling on it, the Courts granted the complainant's demand.

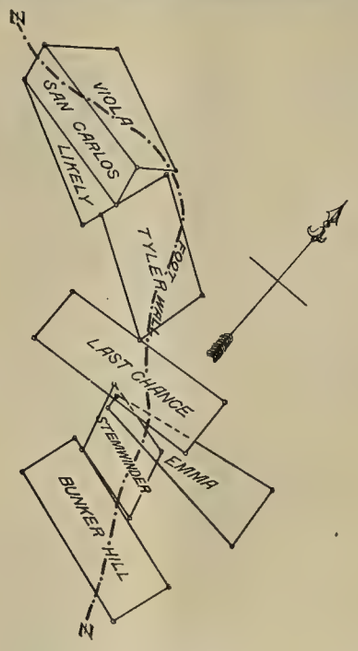


Fig. 2.

The Bunker Hill case involved the adjudication of the extra-lateral rights of the Bunker Hill claim located on the same vein and its position with reference to some of the apex claims of the respondent's, as shown by Fig. 2. The Bunker Hill location was practically admitted to be senior to all the locations of the respondent's locations and after the determination of the facts only one interesting legal question remained to be decided. Respondents again contended for a very broad lode having a foot-wall, as shown in Fig. 2, and a hanging wall entering through the southerly side-line and passing out through the westerly end-line of the claim as originally located. On this theory they claimed that the Bunker Hill location should be adjudged to have extra-lateral rights southerly between a plane passed through the original west end-line and one parallel therewith, passing through the point of intersection of the foot-wall with the southerly side-line. Again the Court held to the commercial hanging wall and, with the entire vein crossing the side-lines of the claim, they were thereby transformed into legal end-lines and extra-lateral rights to the west were granted. The novel point raised by the respondents was that the complainant could not be allowed to follow its vein as desired because it would be following more nearly on its strike than on its dip. They contended that owing to a supposed southerly bend in the vein a point would be reached at a vertical depth of about 6,000 ft. from the surface where anyone following the vein between the planes of the Bunker Hill lines would actually begin to rise with the vein and would, at a distance of about three miles, reach the surface again (See Fig. 3). The Court evidently did not believe this theory, which could only have been demonstrated by workings to a vertical depth of about 6,000 ft. on a vein with an average dip of 40°; but clearly decided that a claim owner had the right to follow his vein downward between the two parallel or converging lines which are crossed by the apex of the vein, even, if more nearly on the strike than on the dip. This decision for the complainant has also been sustained by the higher courts.

Fig. 4 is an interesting illustration of the interlacing extra-lateral right segments, which the legal interpretation of these cases gives to some of the numerous locations on this great vein. The projection shown is on the plane of the foot-wall.

Science, however diverse its aims, is a whole, and men of science do well to impress on the captains of industry that they should not look askance on those branches of investigation which may seem for the moment far beyond any possibility of practical utility.

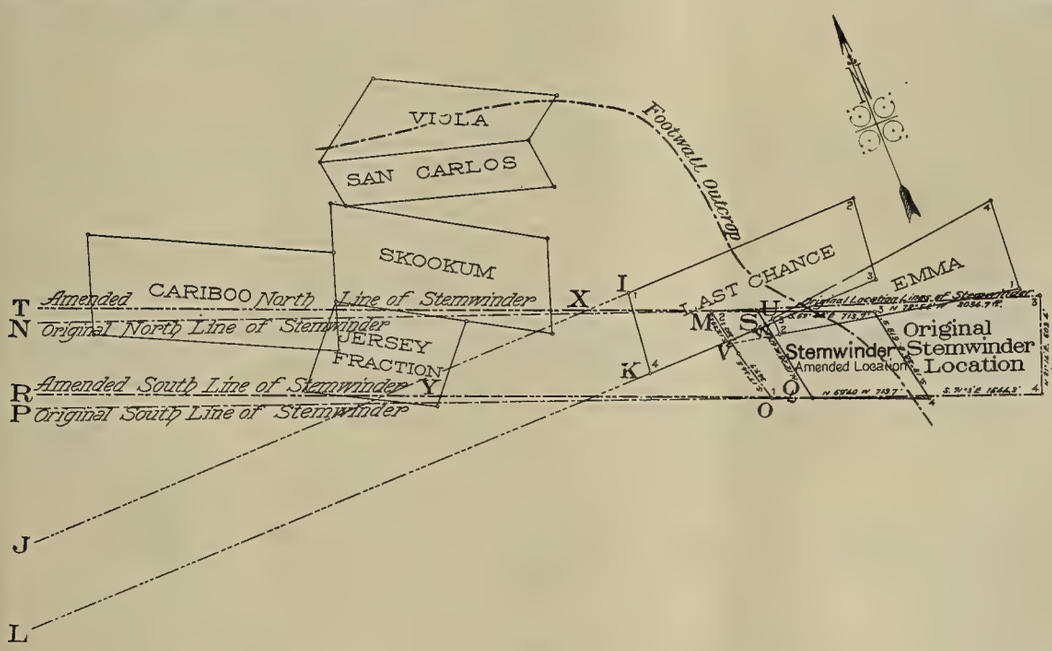


Fig. 1.

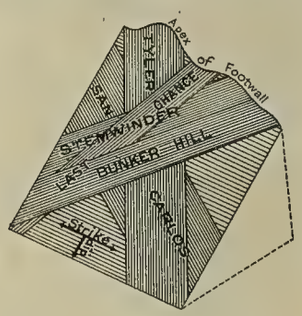


Fig. 4.

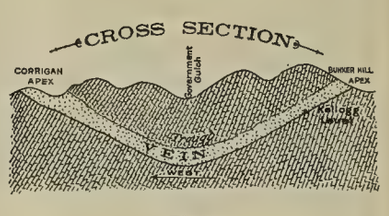


Fig. 3.

California Miners' Association.

Standing committees of the California Miners' Association for the present year have been appointed by President Alfonzo A. Tregidgo, as follows:

Executive Committee — Edward H. Benjamin, Lewis T. Wright, Fred W. Bradley, S. B. Christy, W. F. Englebright, H. H. Yard, G. McM. Ross.

Committee on Finance—Eugene de Sabla, John Martin, Andrew Carrigan, Thomas Rickard, Joseph Sloss, James V. Coleman, George Starr, A. D. Foote.

Committee on Legislation—John F. Davis, A. Caminetti, C. W. Cross, T. A. Rickard, Charles G. Yale, Tirey L. Ford, John R. Tyrrell.

Committee on Mineral Lands and Conservation of Water—A. H. Ricketts, Niles Searls, J. M. Gillette, W. H. Clary, H. Z. Osborne, Frank R. Wehe, S. B. Christy, Charles E. Uren.

Committee on Department of Mineral Industries—W. C. Ralston, J. B. Irish, C. M. Belshaw, W. F. Prisk, F. A. Leach, F. Solinsky, Ross E. Browne.

Committee on Debris Dams—Fred Searls, Fred Harvey, W. P. Hammon, L. L. Myers, J. O'Brien, W. O. Halstead, A. B. Foote, J. S. McBride, W. W. Waggoner.

Committee on Election—W. H. Storms, Nat P. Brown, E. A. Rix, E. J. Ensign, H. E. Miller.

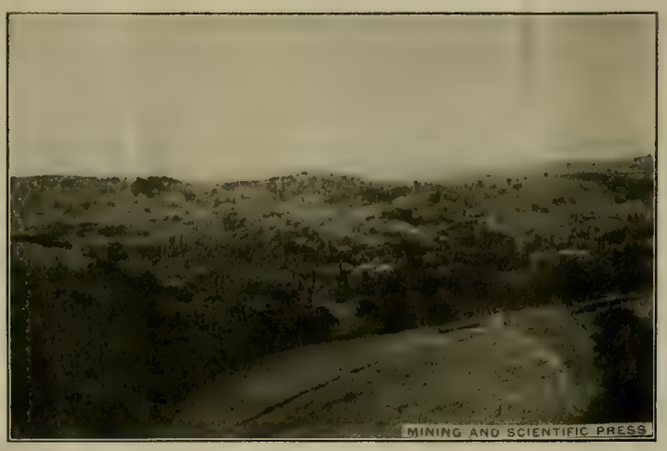
An advisory committee, consisting of all past presidents of the Association and two members selected at large from each county in the State in which mining is prosecuted, will be named in the near future.

Ore Deposition and Deep Mining.

By WALDEMAR LINDGREN.

To the gold miner who has payable ore, the most important question is: Will the ore go down? Does it get richer or poorer? And of answers to this there are many.

Soon after deep mining began in Australia and California, it was found that many veins which were rich at the surface turned poor at a relatively slight depth; in consequence, an opinion developed that the gold in the veins after all was a surface formation. We understand now, of course, that this view was to some extent justified in that an enrichment by surface waters is the rule in the croppings of the majority of gold-bearing veins and is especially prominent in dry climates. On the other hand, it was not appreciated or understood that erosion had removed so much material that the present croppings might be thousands of feet below the point where the fissure reached the surface during the vein-forming epoch. The matter is further complicated by the normal occurrence of the payable ore in 'shoots,' or elongated bodies, distinctly limited laterally and vertically, and by the fact that each vein may contain several of these, below each other, so that their discovery would be a question of more or less extensive exploration.



Sutter Creek, California, the Home of Deep Mining.

We are now able to ascertain that the veins in certain districts were formed relatively close to the surface. These veins usually cut through beds of volcanic rocks, relatively recent flows, the upper surface of which at the time of vein formation we can determine with more or less accuracy. Such are many of the veins of western Nevada, of the Huaraki Peninsula in New Zealand, of Owyhee county in Idaho, and of the San Juan and Cripple Creek regions in Colorado.

In other parts of the world the veins may intersect intrusive rocks, like diorite or granite, which we know to have consolidated at great depth and which were most probably once covered by heavy masses of just such lava flows as are referred to above. From geological studies we may know, with relative exactness, the date of vein formation which is likely to be remote compared to the class of veins alluded to in the previous paragraph. Such are the veins of the southern Appalachian States, of the gold belt of California, and of Australia.

With these generalizations in mind we have a basis for comparison of ore values, although additional data along the lines mentioned are much to be desired. Careful judgment of individual cases is, of course, necessary; for we may conceive surface lavas accumulated in such masses that in their lowest beds the veins would have the same depth from the surface as veins in intrusive and deeply eroded areas. It is also possible that intrusive rocks may be injected to levels only one or two thousand feet below the surface. This has happened, for instance, in the San Juan region in Colorado. The vital point is the correct estimate of the amount of erosion which has taken place.

Among the causes which produce ore precipitation from aqueous solutions the most generally advocated are (1) mingling with other waters, (2) reducing agents, such as carbon or ferrous sulphate, and (3) diminishing pressure and temperature. The last cause has been most freely advocated, and often for cases of small differences of depth. I have shown elsewhere† that, although it is of great importance, the argument must be applied with much discrimination since actual observations show that ore precipitation takes place within a wide vertical range. If it can be shown, however, that ore deposition changes in depth, gradually and generally, that change must be due to pressure and temperature.

A review of the veins which cut through surface lavas will show that many of them have been followed down for over a thousand feet from a point which was undoubtedly near the original surface. In the Silver City district a depth of over 2,000 ft. has been attained, in Cripple Creek 1,500 ft., and in the San Juan country, Colorado, at least one of the veins has actually been proved payable within a vertical range of 3,000 ft. But in most cases the ore—which generally is of higher value than in the deep gold-quartz mines in California—seems to decrease somewhat in quantity and value as the lowest levels are reached, and in many cases the decrease is marked and conspicuous. Extremely rich masses of ore—bonanzas—within moderate distance from the original surface are really characteristic of these veins, and are frequently still further enriched by oxidation and the formation of secondary sulphides.

A review of the veins which cut through large intrusive masses and their surrounding sedimentaries and whose upper parts have been removed by erosion leads to encouraging results, especially with veins carrying free gold. First among them we should mention the veins and saddle reefs of Bendigo, Victoria, which have lately been opened at a maximum depth of 4,156 ft. and proved payable, in part at least. But it is stated that below a vertical depth of 2,500 ft. fewer orebodies have been found than above that limit and that the deeper explorations have not as a whole proved economically successful. The amount of rock removed by erosion since vein formation in this district is difficult to estimate. Some of the figures given by Australian geologists seem far too large, but at any rate it must be at least 3,000 ft.; so that we may assume that deposition of free gold with quartz took place at least to a depth of 7,000 ft. below the original surface.

In the deep Ballarat quartz mines the grade and quantity of ore appear to decrease somewhat in depth, although they have scarcely attained a depth of 2,000 feet.

Turning now to the California quartz mines in the foothills of the Sierra Nevada, the latest results (which, as yet, are little known beyond the State) offer much encouragement to those who believe in deep mining. In Grass Valley 10 years ago the outlook for the two principal mines, the North Star and the Empire, seemed doubtful; since then the former mine has found ore equally as rich as in upper levels down to a vertical depth of 1,600 ft. or 4,100 ft. on the incline of the vein. The Empire has sunk its shaft to 3,160 ft. on the incline (1,286 ft. vertically) and it was recently stated in the press that the ore-shoot had been found on the 3,000-ft. level. Many years ago the Idaho mine in the same camp found ore at a vertical depth of 2,200 ft., but the explorations were discontinued owing to the fact that the principal ore-shoot was located at a higher level and seemed far more inviting to follow.

On the Mother Lode deep mining has principally been carried on in Amador and Calaveras counties. The depths of some prominent mines are as follows:

	Incline. Feet.	Vertical. Feet.
Lincoln	2,000	1,766
Ballot	....	1,800
South Eureka	....	1,800
Central Eureka	2,300	2,030
Oneida	....	2,300
Kennedy	....	2,863
Argonaut	....	2,100
Zella	....	1,300
Gwin	....	2,380

The Kennedy is now said to be stoping on the 2,700-ft. level; the Central Eureka at a depth from 1,900 to 2,000 ft.; the Oneida below the 1,900-ft. level; the Gwin below the 2,000-ft. level. These gratifying results have proved that at the depths indicated free gold ores are found of similar character to those occurring nearer to the surface, although the rich pocket bonanzas seem to be of less frequent occurrence in the deeper workings. The hope of finding payable ore at still greater depth has been greatly strengthened, and it may well descend to the deepest levels attainable by mining. On account of increasing temperature this will perhaps not greatly exceed 5,000 ft. The thickness of crust removed by erosion in the foothill region since vein formation is, of course, difficult to estimate with exactness, but it may not exceed 3,000 ft. At any rate it seems certain that deposition of free gold ores in the California veins has proceeded at depths from the surface of about 6,000 feet.

The gold deposits of the southern Appalachian States offer an example of deep 'roots' of veins; the amount of erosion from the croppings at the time of deposition doubtless greatly exceeds the figures given for Australia and California, and still free gold ores have been found and followed in some cases to a depth of over 1,000 ft. They are usually of low grade, although small shoots and pockets of ore occur which are fully as rich as anything found in California or Australia.

It may, therefore, be confidently asserted that deposits of gold-quartz ores extend at least over a vertical range of 6,000 or 7,000 ft. There is some evidence that the conditions for deposition grow less favorable as depth increases, but the change takes place slowly. The richest ores are those near to their original apex. Most of the deep mines in the Mother Lode region of California carry ores of comparatively low grade ($4 to $8 per ton), and are only payable on account of the availability of cheap metallurgical processes.*

The Kennedy Mine, Jackson, Amador County.

THE names of the new camps in Nevada are mostly of Piute origin. The Piutes—an Indian tribe—formerly traversed the region. 'Pah,' a termination frequent in such names, means water; so that Tonopah may be translated 'brush springs,' Ivanpah is equivalent to 'stagnant water' or 'quiet pools.' Panamint is usually spelt without the h, but it ought to be Pah-na-mint, which standsfor 'water from snow.' The highest peak of the Panamint range is snowclad throughout the year; Furnace creek rises between the peak and the Funeral range, being fed by the snows of both ranges.

MINING is an important feature of Norway's industrial life: Iron, copper, feldspar, granite, etc., abound. In 1904 Norway exported 116,550 tons of iron pyrites and 2,700 tons of copper. Her iron is needed in Birmingham, Sheffield, Solingen, and all over the world for the making of certain instruments, implements and tools. She exported 21,000 tons of feldspar in 1904. Much of this is used in the porcelain factories of the outside world. Granite and other building stones are exported to England and continental Europe. Over 190,000 tons were taken out in 1904.—*Iron Age.*

*Abstract from an article appearing in *Economic Geology*, Vol. I, No. 1.

†'Nevada City and Grass Valley,' 17th Ann. Report, U. S. Geol. Survey, Part II, p. 177.

The Progress of Half a Century.

In celebrating its semi-centennial *The Iron Age* says:

The nineteenth century witnessed a development in the arts and sciences more rapid and more uniform than that attributable to all the centuries of the historic period which preceded it. What may have happened in the mysterious 'East' before the curtain rose upon a civilization of unknown antiquity is a matter of conjecture; but it is safe to assume that, however high in some aspects, it was very unequally developed and that there are no 'lost arts.' The nineteenth century received undiminished its heritage of knowledge and added thereto vastly more than it had received. It was the golden age of invention and discovery, probably because it found itself confronted by so many relatively easy problems.

Grant Allen, in one of his charming natural history essays, tells us that for centuries there has been a struggle between the squirrels and the nuts. The nuts, for their better self-protection, have been thickening their shells, and the squirrels, to get their food the better, have been strengthening and sharpening their teeth, with the net result that all the soft-shelled nuts have been eaten and are extinct in squirrel-haunted forests, and the squirrels with dull and weak teeth have starved to death and left no successors. This happy conceit may very well be chosen to illustrate the relation which for a century has existed between the inventor and his problems. A few basic discoveries of natural phenomena, before unobserved or quite misunderstood, opened the door to thousands of relatively easy problems in chemistry, metallurgy, mechanics and engineering. The difficulties they presented were largely the result of the limitations which hampered the inventor in available materials and tools. The end of the century found most of these relatively easy problems, and many of those presenting great difficulties, successfully solved. There now remains very little room for the empirical inventor who turned to practical account the happy accidents which he had learned to observe and reason about. In a word, the soft nuts of the arts and sciences have mostly been eaten, and the race of inventors who did little more than pick up what they found lying around neglected, if not dead, has lapsed into relative unimportance.

This illustration applies better to the first half of the nineteenth century than to the last half. Especially in its last quarter it was made glorious by results which confused statistics and silenced prophecy.

It was not until May 24, 1844, that the first intelligible message was sent over the wires stretched between Baltimore and Washington, in the words: "What hath God wrought?" Practically the whole system of electrical communication has developed since 1855, the year of the beginning of *The Iron Age*, certainly all of it which contributed to the facilitation of trade. Duplex telegraphy was not reached until 1872, and multiplex not until 1878. Electric signaling began in 1857, but did not reach an important development until some 10 years later. The first Atlantic cable message, from Queen Victoria to President Buchanan, was sent August 16, 1858. Wireless transmission is, of course, a matter of yesterday.

The development of electricity for power purposes and the dynamo for its generation has all happened within about 40 years. Hjorth's dynamo, the forerunner of this type of machines, appeared in 1855. In 1866 Wilde produced his dynamo with permanent magnets to excite the coil-wound field magnets of a large machine. The present type of dynamo, which dispenses with permanent magnets, was made by Siemens in 1869. Since then all the work of Weston, Brush, Thomson, Houston, Edison, Westinghouse and the other great mechanics who have contributed to the perfection of the dynamo and the utilization of electric currents has been done.

The first electric railway was built in 1879; the first in the United States in 1885. The electric motor was an accidental development from the dynamo in 1873. Considering the present magnitude of the electrical development and its relation to civilization, the newness of it all is startling, even to those of us who witnessed its tentative beginnings and wondered what potentialities of practical usefulness might reside therein.

Electric lighting is still newer. The practical arc was born in the Jablochkoff candle of 1877. The arc lamp of the modern type was developed between 1878 and 1883. For the first incandescent lamp we waited until 1883.

The telephone, which perhaps more than anything else has revolutionized modern business methods, reached the domain of the practical about 1876. That in less than 20 years it would leap from the status of a scientific toy to that of an instrument of universal utility not even the most optimistic prophet would have ventured to predict. It is of interest to mention in passing that for several years after the telephone had come into general business use it was refused admission to the office of *The Iron Age* on the ground that it was liable to be used as a vehicle of misleading trade information and that its easy facility might be abused by designing persons to the injury of others. This reasoning was probably good at the time, but would not carry conviction to-day.

Hydro-Electric Power in India.

The Government of British India has for some time pursued a broad-minded policy in developing the latent possibilities of the immense and valuable country over which it exercises sovereignty. The first notable project undertaken for the generation and distribution of electricity was that of the Cauvery power scheme, in Mysore. Work on this plant was started in 1900, the initial installation being finished after many difficulties in June, 1902. About a year ago the second extension of the plant, consisting of 3,610 kw. generator capacity, was completed. This increased the possible output of the entire plant to 7,920 kw., making it the largest hydro-electric installation now operating in southern Asia. The chief credit for the completion of this power plant is due to Major A. J. de Lotbiniere, Deputy Chief Engineer of the Government of Mysore, who not only conceived the plan of the installation, but successfully arranged for the financing of the entire project.

The power scheme next to be undertaken is on the Jhelum river in Kashmir, northwest India. This power plant is to be installed near Rampur, about 50 miles below Srinager, where a six-mile conduit will give a head of water at the plant of about 400 ft. The present plans call for an installation of about 20,000 h. p. It is planned to use the power for operating the Kashmir section of the Jhelum Valley railway electrically along its entire length of 180 miles. A single-phase system of traction will undoubtedly be installed. Possibly the most important immediate use to which the power will be put will be in operating dredgers for the purpose of deepening the Jhelum river in the Kashmir Valley, and thus minimizing the floods, which, under existing circumstances, devastate the entire country.

After successfully completing the preliminary arrangements for carrying on this important work, Major de Lotbiniere was instructed to proceed to Europe and America in order to interview the leading hydraulic and electrical manufacturers, and to ask those selected to bid upon the machinery and materials for the plant. As a result of this investigation he recommended to his Government that the contracts for the entire hydraulic and electrical equipment be placed with firms in the United States. The contract for the hydraulic equipment was awarded to the Abner Doble Company of San Francisco, and calls for the hydraulic plant complete from the forebay to the tailrace, including the intake, valves, pressure pipes, pressure-pipe thrust blocks, interior piping, water-wheels and nozzles, hydraulic governors, and all details necessary for the hydraulic equipment. The apparatus and materials are to be delivered at the Port of Karachi, India.

The gravity conduit line for the power plant will be 34,000 ft. long, the upper 8,500 ft. to consist of an excavated ditch lined with masonry. The remaining portion of the water channel will be a rectangular flume, or a wooden stave pipe, such as has been installed so successfully in connection with plants of this character on the Pacific Coast. The flume will have a capacity of over 500 cu. ft. per second. The pressure lines will consist of riveted steel pipes designed with a factor of safety of five, each supplying one of the hydro-electric units. For each pipe line a standpipe and two special vacuum valves will be provided in order to protect the pipe against injury in case the water should be drawn out suddenly. At the lower end of each pressure line the last length of pipe will terminate in a flange, which will be bolted to a massive cast-iron thrust-block that will rest on a heavy cast-iron sole-plate or base. The latter will be mounted on a substantial masonry foundation and held in position by anchor bolts. This fitting will be designed to take the entire hydraulic thrust of the pipe, an ample factor of safety being allowed, so that under the most severe conditions there will be no strain on the branch piping in the interior of the power house. Each pressure line will consist of a riveted steel pipe varying in diameter from 30 to 36 in., and a 54 to 36-in. taper pipe, 10 ft. long at the upper end. The pipes will be 790 ft. long and will deliver the water under an effective head of 400 feet.

Twelve main units and three exciter units have been planned for the equipment of the power house. Each main unit will consist of a Doble tangential water-wheel, with automatic oil-pressure governor delivering 1,765 brake h. p. to the shaft, under an effective head of of 400 ft. Each wheel will be direct connected to a 1,000-kw. alternator, the speed of the unit being 500 rev. per min. The exciter units will each consist of a Doble tangential water-wheel, delivering 285 brake h. p. to the shaft under an effective head of 400 ft. The speed of the exciters will also be 500 rev. per minute. The water-wheels will be equipped with ellipsoidal buckets, needle-regulating nozzles and centrifugal water-guards. The regulation of the main units will be effected by means of hydraulic governors operating jet-deflectors. For the exciter units hand regulation will be provided by means of the needle nozzles. The gate-valves for each wheel will be of special construction, with outside screw and yoke, bronze-mounted, with by-pass.

The conditions under which the plant will be installed are decidedly out of the ordinary as compared with similar work in this country. The specifications for the electrical and hydraulic equipment stipulated that no single piece of machinery should weigh more than four tons when packed, for the reason that there is 200 miles of road transportation, including a lift over a range of mountains 8,000 ft. high. Transport in that region is limited to bullock cart, and no single piece of machinery heavier than four tons can be transported, a total of five tons including the trollie (cart) being the maximum weight that can be hauled over the mountains. Portland cement costs $7.50 per bbl. delivered at the site, making its use prohibitive for heavy concrete work. However, there is plenty of natural rock in the vicinity, so masonry construction will be used for the walls of the power house and for foundations.

THE PROSPECTOR.

The rock samples from Salome, Ariz., marked 'Martinez,' are all of the same kind of rock—syenite. No. 1 is completely kaolinized. No. 2 is also kaolinized, but still shows much iron oxide from decomposition of the hornblende. No. 3 is nearer the normal rock, but is much decayed. The hornblende and feldspar are still showing plainly.

The rocks from Phillipsburg, Mont., marked 'P. C. W.,' are: No. 1, two pieces, one of which is a fine-grained mixture of quartz and feldspar—aplite; the other is dolomite; No. 2, an aggregate of talc scales and calcium carbonate, carrying pyrite and chalcopyrite; No. 3, a brecciated crystalline limestone.

The ore from Granite, Or., is quartz with pyrite, galena and a little zinc blende. The more silicious portions of this ore should concentrate readily on jigs and tables. The ore probably contains gold and silver.

The rock specimens from Multnomah county, Or., are andesite, a volcanic rock. The yellowish powder is iron oxide, due probably to the oxidation of a micaceous mineral, like biotite, or one of the pyroxenes, like enstatite or hypersthene.

The rocks from Holmes, Wyo., are: No. 1, a leucite rock similar to phonolite; No. 2, syenite; No. 3 very much decayed, but probably also syenite.

The rock specimens from Red Rock, Ariz., have been classified as follows: No. 1, quartz-porphyry, in which may be seen quartz, plagioclase feldspar, hornblende and epidote, the latter resulting from the alteration of hornblende. The presence of considerable pyrite suggests the possibility of the rock coming from the vicinity of a vein or ore deposit. No. 2 is a dike rock; No. 3, also a dike rock similar to No. 2, but less decomposed; No. 4 is a volcanic rock (trachyte); No. 5 is granite, consisting of pink feldspar (orthoclase), quartz and black mica (biotite); No. 6 is quartz-diorite; No. 7 is pegmatite; No. 8 is a feldspathic dike rock.

In sending samples of ores, rocks and minerals to 'The Prospector' department for determination it is necessary that the following be remembered and observed: 'The Prospector' makes no assays, or analysis, but determines samples by simple means. Advice and suggestions will be given as far as possible, where requested. All samples must be accompanied by the name of the sender and the locality from which the sample came, together with such explanatory notes as seem advisable to the sender. Each sample should be carefully wrapped in paper with a tag within bearing a number, by means of which it may be identified. Samples of fine materials or those which crumble readily should be put in tin or wooden boxes, preferably the latter, as sometimes they are destroyed in the mails, owing to their friability or softness. Hard rocks and ores need only be wrapped in paper of any kind and accompanied by the number and locality. Where there is more than one piece they may be sent in a canvas bag. Very small samples are usually more difficult to determine than larger ones, as often a portion of the sample must be destroyed in making tests. No replies by mail need be anticipated. The result of examination will be found in the Prospector department, and if the samples have been sent as directed above, there will be no difficulty about the sender being able to recognize the description of his samples. The determinations in the prospector are made for subscribers to the MINING AND SCIENTIFIC PRESS only.

The rocks from Vanderbilt, Cal., are: No. 1, mica schist; No. 2, quartz with considerable micaceous iron disseminated through the rock; No. 3 (gray), andesite; No. 4 (black), augite andesite; No. 5, limestone, slight stains of copper; No. 6, quartzite.

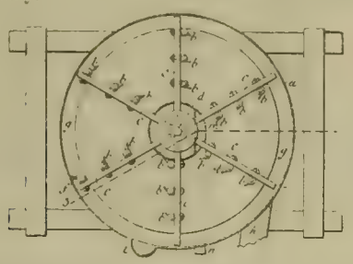
The specimens from Los Angeles, Cal., marked 'A. G.,' are: No. 1, satin spar (gypsum); No. 2, calcium carbonate.

Mining and Metallurgical Patents.

PATENTS ISSUED DECEMBER 26, 1905.

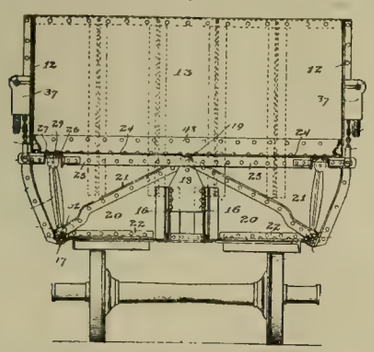
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR TREATING AND AMALGAMATING METALS.—No. 808,787; G. P. Tyars, Cape Town, Cape Colony.



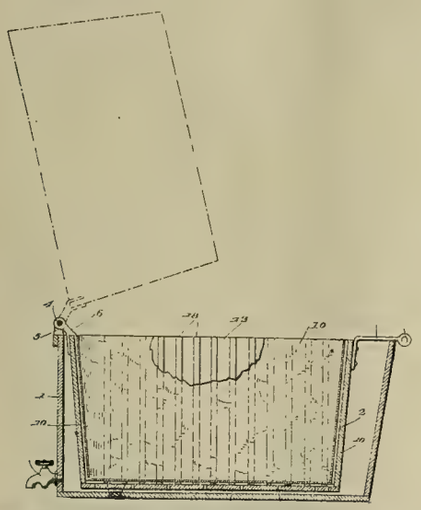
The combination of a vessel for treating and amalgamating ores, a shaft in the vessel carrying arms, paddles depending from the arms and arranged in a spiral around the vessel, the blades of the paddles being set at the same angle to the radii of the arms and so arranged that the leading edge of any blade traces out the same path as the outer rear edge of the preceding one, and a channel extending around the outer edge of the bottom of the vessel.

DUMPING CAR.—No. 808,750; F. M. Hubbard and C E. Taylor, Chicago, Illinois.



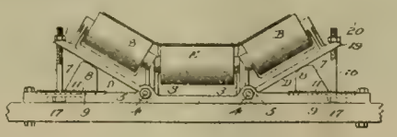
In a dumping car, the combination with the side and end walls of a car body and a suitable supporting underframing, of a car bottom composed of floor sections hinged to the underframing along the longitudinal median line of the car bottom, displaceable strut members hinged to and supporting the outer side margins of hinged floor sections in a horizontal load-carrying position, means for tripping and throwing inwardly the lower ends of hinged strut members, and means for raising and lowering the outer side margins of hinged floor sections between load-carrying and load-discharging positions.

LEACHING TANK.—No. 808,675; A. B. Mouck, Twisp, Washington.



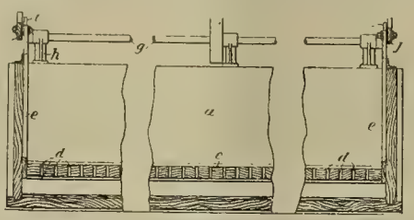
The combination with a reservoir or tank, of a leaching tank pivotally suspended therein and held out of contact therewith and adapted for dumping movement, tank comprising a plurality of compartments each having a perforated bottom, slats or spacers secured to the four walls and bottom of each compartment, and a filtering medium disposed within each compartment and held out of contact with the walls and bottom thereof by the slats.

CONVEYER BELT SUPPORT.—No. 809,227; A. W. F Steckel, Columbus, Ohio.



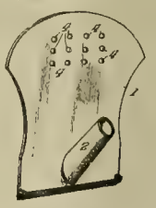
In a conveyer, a belt support consisting of combination of two inclined pulleys, a movable carrier for each pulley operable up and down in planes transverse to the belt, an intermediate support for the belt independent of pulleys, and means for operating carriers to adjust inclined pulleys relative to intermediate support.

APPARATUS FOR THE AGITATION OF SOLUTIONS USED IN ELECTRO-DEPOSITION OF METALS.—No. 808,798; W. C. Wood and B. Oaksford, London, England.



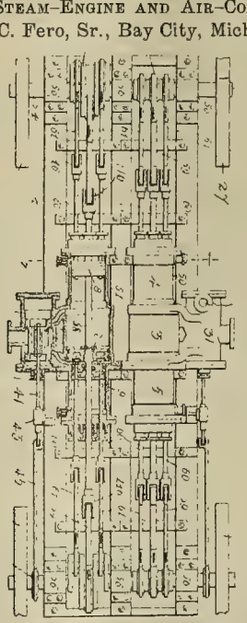
In an apparatus for the electro-deposition of metals, the combination with the tank for containing the electrolyte of a trough arranged within the same, the trough having within it a plunger designed for drawing the electrolyte into the trough and ejecting it therefrom.

MINER'S LAMP SAFETY SHIELD.—No. 809,111; R. I. Jenkins, Lewistown, Montana.



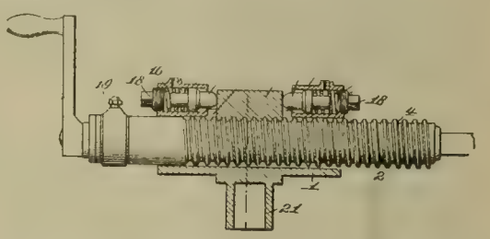
In a shield having a plurality of openings near its upper end and an opening near its lower end, a sleeve surrounding said opening, a trough carried by the lower end of the shield, a horizontal flexible projection carried by the shield at its lower end to hold the same against upward movement, and a semicircular support secured to the back of the shield to hold the same against sidewise or tilting movement in combination with a miner's lamp.

COMBINED STEAM-ENGINE AND AIR-COMPRESSOR.—No. 808,526; C. Fero, Sr., Bay City, Michigan.



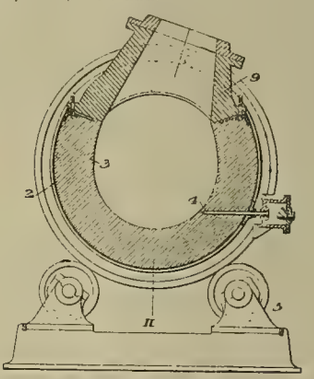
A combined steam-engine and air-compressor, comprising a support, a central cylinder mounted thereon and provided with steam inlet and outlet ports adjacent to its ends, end cylinders having their outer ends closed and their inner ends in communication with the ends of central cylinder, air inlet and outlet valves adjacent to the outer ends of end cylinders, crank shafts, a piston rod for central piston projecting through each of the end pistons and connected to crank shafts, piston rods for end pistons connected to crank shafts, a steam valve for steam inlet and outlet ports in central cylinder, and an operating connection between steam valve and one of crank shafts.

ROCK AND COAL DRILL.—No. 808,837; L. C. Hardsocg, Ottumwa, Iowa.



In a drill, a housing, a hammer mounted therein and provided with exterior screw threads, a slidably mounted hinged block having screw-threaded engagement with hammer, spring-pressed plungers located at opposite ends of block for cushioning the movements of the same, means for adjusting the tension of the springs of plungers, and means for turning hammer.

METHOD OF CONVERTING MATTE.—No. 808,618; C. M. Allen, Lolo, Montana.



The method of converting matte, which consists in bessemerizing in a converting vessel having a non-silicious interior, a charge of molten matte until it reaches the grade of white metal, then transferring it to a smaller silica-lined converter and finishing the bessemerizing therein.

A New Gasket.

The ever-increasing steam, water, air and gas pressures call for improvements in joint connections to withstand the highest service. Such joints must be absolutely tight under any pressure. They must be quickly made and taken apart. The joint should be as thin as possible; it should not leak when cold or hot, or from unequal expansion. The gasket should not cause electrolysis. Therefore, on iron pipes, a gasket composed of iron should make the best joint. The attention of engineers is called to a corrugated iron gasket coated thinly with a special iron cement that appears to fill these requirements, and is said to make the thinnest and strongest gasket in use and the nearest to a ground-joint. It is as durable as the pipes it connects, as well as one of the cheapest gaskets. The active principle of a slight expansion found in these gaskets when made up makes the connections tight and strong, which is not obtained in inert or dead material commonly used for such purposes. These gaskets are manufactured by the Smooth-On Manufacturing Co., at Jersey City, N. J.

Commercial Paragraphs.

THE Salt Lake City branch office of the Allis-Chalmers Company will be removed after January 10 to the Dooly Building, 117-119 East Second South street.

CONTRACT has been closed for two 'Hornsby-Akroyd' oil engines, 16 h. p. each, built by the De La Vergne Machine Co. of New York, for the Golden Key Mining Co., Hillside, Arizona.

THE Chicago Pneumatic Tool Company state that arrangements are under way for increasing the capacity of their compressor works at Franklin, Pa., so as to give them an annual output of between 650 and 700 compressors.

THE Robins Conveying Belt Co. has opened an office at 749 Railway Exchange Bldg., Chicago, Ill. C. K. Baldwin, the chief engineer of the company, is in charge of this office and is prepared to handle all inquiries from parties located in the Middle West.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The Alaska bismuth mine, 40 miles northwest of Nome, will be opened up next May, and the first shipment will be made out of the north country on June 15. ——Two large cargoes of concentrates, aggregating 2,500 tons, are en route from the Treadwell mines, on Douglas Island, to the Tacoma smelter.

ARIZONA.

(Special Correspondence).—The action of President Roosevelt in regard to fake mine promoters throughout the country has been received with satisfaction in Arizona. In the past a large number of these fakirs have operated in this Territory and have been a serious menace to legitimate mining. However, at present, we have but very few of them, and trust that their number will be still less from now on.——Mining throughout northern Arizona in all its branches was never more active than at present, with the advent of the new custom smelter at Humboldt, with the discoveries on Bill Williams Fork and general activity throughout the mining districts things are looking brighter than for some time past. Mining on the Bill Williams Fork, where the recent discoveries were made, is demanding many miners, and before winter is passed hundreds of men will be employed by the big companies going in there. Many hoisting plants are being put on the various mines, as the shafts are getting below the depths where whims and windlasses can be used to advantage. The mines are all showing up well. The Arizona Smelting Co. at Humboldt, Yavapai county, is getting its lead stack ready to blow in, the copper stack having been completed. The plant will handle 800 tons of lead and copper ore daily. Its agents have been very busy for several months past buying ore throughout northern Arizona, and large amounts are now being shipped awaiting the beginning of operations.——Silver ore running as high as $1,000 per ton has been found in the Carrollton mine, near Dewey, at the bottom of the 150-ft. shaft. The vein measures from 6 in. to 4 ft. and carries native silver and chloride of silver. It also carries 1.25% copper and the same amount of lead. The claim is a contact vein lying between porphyry and granite. The strike was made where the vein cuts a porphyry dike. In sinking the shaft, Mr. Carroll found iron tools of primitive patterns, which he believes were left by the Spanish expedition that explored Arizona in 1539.—— The Gold Bullion mine, near Old Glory, Santa Cruz county, has been sold for $25,000; it is understood that $100,000 will be spent in development work.——The Great Republic mine, Yavapai county, has made a strike in a crosscut that was being run from the 700-ft. level; the ore is practically solid copper sulphide.——Ore carrying gold, silver, lead and copper has been struck in the Senator mine at Paradise. The Empire State also got 5 or 6 ft. of the same kind of ore on the 100-ft. level.——The Gold Lode Mining Co. has nearly finished a 10-stamp mill and three concentrators. They have 2,500 ft. of development done, exposing ore much of which averages $40 per ton.——Work on the Rainbow mines, near Turkey creek, will begin at once. One shaft is down 40 ft. and is in solid sulphide.——The annual meeting of the Arizona Mining & Milling Co. was held in Prescott, January 10; officers were elected and arrangements completed for starting work. The properties owned by this company are in the Santa Maria district. ——The United Verde Company of Jerome, Arizona, has purchased the shafting, Corliss engines, rails, cars, etc., which were a part of the plant of the Albemarle Mining Company's cyanide mill at Bland, New Mexico, for $18,000. This machinery will be moved to Jerome where it will be used in the construction of a new mill for the United Verde Company. It is stated that the Blue Leaf group in Black Rock district will be taken up by an Eastern syndicate.——The fight that has been waged for more than a year among the officers and stockholders of the American Copper Co. has reached the Supreme Court of Arizona. This company had been declared insolvent in the District Court of Yavapai county, and some of the stockholders have petitioned the Supreme Court for a review of the bankruptcy proceedings, claiming fraud.

Prescott, Jan. 13.

Cochise County.

The Arizona & Michigan Development Co. is developing the Copper Chief mine, in the Little Dragoon mountains, near Wilcox. President A. J. Pidgeon is at the mine.——The Black Diamond Co. is working its claims near Pearce.

Graham County.

It is expected that the Sierra de Oro Gold Mining & Milling Co's. tunnel near Clifton, now in 1,500 ft., will strike the main lead in 275 ft. F. B. Eldridge is president.

Mohave County.

The Benedictine Mining Co., with properties near Cedar, have put on a tank wagon service between the mines and Yucca to haul fuel oil for use at the mines.

S. R. Rhea and others have taken a lease on the Tennessee mine, near Kingman, and will unwater it and begin mining in the old stopes and lower levels. The water from the mine will be used in the mill. When the mine is unwatered, water will be obtained from the Empire mine, owned by the same company. It is probable that a zinc separation will be made in the mill, as well as saving the values in lead. High-grade zinc tailings are in the pits at the mill.

Pinal County.

W. B. Twitchell, general manager of the Big Lead Mining & Smelting Co. near Kelvin, is arranging for machinery for a 100-ton concentrating plant.

The Newbury Mining Co. is preparing to resume work on its properties near Florence. C. M. Schofield has paid $5,000 of the concern's debts.

Yavapai County.

The Rigby Mining & Reduction Co. has completed its plant, using the Pohle-Croasdale volatilization process for the extraction of minerals, and is making its experimenting run. The furnaces have a daily capacity of 150 tons.

The Hite Gold Mining Co. has bought the King Solomon's mines, near Martinez, from J. Ellis for $35,000. R. J. Rice is manager. A hoist is to be put in and development pushed.

CALIFORNIA.

Amador County.

The copper mine, owned by Mr. Thayer of San Jose, Lancha Plana, is being equipped with a hoist, to be run with water power.

An electric pump is being put in at the South Eureka mine, near Sutter Creek, designed to pump 2,030 ft. on the incline or 1,800 ft. on the vertical, handling 100,000 gal. per day. This will aid in draining the Central Eureka mine.

Calaveras County.

Work has been started at the Josephine mine on the San Antone, 7½ miles from San Andreas, by Thomas Shearer, George E. Walker, et al. A 3-stamp quartz mill has been purchased and will be put in.

El Dorado County.

The parties who have the Snow mine at Newtown have an incline shaft down 50 ft. and have struck gravel.

A stamp-mill is being torn down and moved from the Lady Emma mine at Kelsey to the Reese & Roemke mine at Spanish Ranch. The lessees of the mine have decided to equip and operate the mine. Fred Schmeder will set up the stamp-mill.

Fresno County.

G. W. Ade, trustee for the Copper King mine, near Clovis, states that work is being done at the mine. They are sinking a shaft from the 600-foot level to the 700-foot level. All the preferred labor claims have been paid.

Humboldt County.

The Legal Tender Dredger & Placer Mining Co. and the National Statutes Dredger & Placer Mining Co. have filed locations on the Klamath river, between the forks of the Trinity and the Salmon, near Orleans.

Inyo County.

It is reported from Keeler that the 150-ton smelter that is being put in to treat the tailings of the old Coso-Gorda mine will be ready by the 15th of February.

Kern County.

P. H. McMahon, superintendent of the Butte Lode mine near Randsburg, states that he mined and milled during December 75 tons of ore, which plated at the Red Dog mill $6,600, leaving in the tailings $12 per ton.—— The Papoose Mining Co. has men at work on the Papoose tungsten mines taking out rich ore. They will soon ship another carload.——The Gold Coin and Stanford mines, near Randsburg, are working a full force. The ore mined is being milled at the Red Dog mill under the management of Frank Mann.

Los Angeles County.

E. Reid, one of the stockholders of the Borland Mining & Milling Co. at Silverado, 24 miles from Santa Ana, states that his company has determined to build reduction works on its property.

Mariposa County.

The owners of the Three Trees mine, five miles north of Hornitos, have sunk an incline shaft 175 ft. A hoist, two-stamp mill and equipment for electric power are being put in. Power will be obtained from Merced Falls. The operators are Morrell & Jacobs of Oakland, and others.

Mono County.

A contract has been let to Gillis & Mitchell to sink the shaft 50 ft. deeper at the Pittsburg mine. When the 150-ft. level of the shaft is reached, the force will be increased and crosscuts and drifts run.

Nevada County.

The South Yuba Water Co. has notified all the mines of Grass Valley and Nevada City that there is now sufficient water available so that they can resume work with full forces.

The new electric trolley line built by the North Star near Grass Valley has been completed. The line is two and one-half miles long and connects every department of the Central and North Star mines. It will carry ore from the Central shaft to the North Star mill and thence to the cyanide plants. In addition to this it will convey iron, ore or any material to any part of the mine. It will take the place of several teams which have been hauling between the two mines.

The North Bloomfield, Milton and Eureka ditches in the upper part of the county, which were blockaded for several days on account of the big storm, have been reopened and the water is running again as usual. The Union Blue and Malakoff mines at North Bloomfield, which were compelled to shut down for a few days because of the failure of the water supply, are operating as usual.

The new electric hoist to be put in at the Central Consolidated mine has arrived at Nevada City.

Superintendent A. A. Charonnat has been making arrangements for a resumption of work at the Banner gravel mine and the Charonnat quartz property, near Nevada City. The Banner gravel claim is worked through a tunnel and the channel will be further explored. The incline shaft at the Charonnat will be unwatered and when the bottom is reached sinking will be commenced.

The heavy continuous rains are filling up the reservoirs and ditches in this county, and every mine which has been suffering for lack of water is running full blast. ——The new mill at the Oustomah, at Nevada City, has been started for the first time since it was completed.—— The Home, Lecompton, Sierra Queen, Blue Tent, Delhi, Murchie and Champion have started, but the Mountaineer will not attempt to reopen for some time.—— The shaft on the Woodberry mine, on Osborne hill, is now down a distance of 210 ft. on the incline.

The new air compressor at the Spanish Ridge mine, near Washington, is furnishing power for the air-drills in the mine.

Plumas County.

The Red Mountain Consolidated Gold Mining Co. has acquired the properties of the Rappahanock company in French ravine, near Spanish Flat, as well as the Sheldon and other properties, and will develop them under the direction of Mr. Woodrum.

Shasta County.

B. F. Rogers has started work at the South Fork and Chicago mines, north of Igo. A 2,350-ft. tunnel has been driven on the South Fork.

The Great Western Gold Co. will put in a second and larger furnace at the Ingot smelter and will erect a zinc plant in which zinc white will be produced from the fumes of the smelters. M. E. Dittmar is managing director.——At the annual meeting of the Redding Gold & Copper Co., the following directors were elected: H. D. Irwin, president; T. M. Gilbert, vice-president, Thomas Gilbert, secretary. The directors have arranged to install a power plant and custom smelter this year.

Sierra County.

The Twin Eagle quartz mine at Kanaka has been bonded to the Empire Gold Mining Co. operating at Gold Valley. John Reid has charge of work.——The Rainbow mill, near Alleghany, is running 10 stamps. F. Low has charge.——The Swansea mine, near Alleghany, has been started by J. Brock.

Siskiyou County.

The King Solomon mines, near Cecilville, Liberty mining district, will be equipped with a milling plant and other machinery as soon as the road is built from Black Bear.

The Pittsburg Gold Mining Co. (the New Hope mine) is putting up a quartz mill, a boarding-house and bunkhouse and will put in a hoist, pump and electric machinery. Paris Mathewson is superintendent.

Sonoma County.

The big dam built last year by the Socrates Mining Co. on Sulphur creek was washed out on Jan. 11. The dam was 40 ft. high, spanning Sulphur creek, and was 30 ft. in width. It furnished water for the electric power plant, which cannot be used until the dam is rebuilt.

Tulare County.

At the Redfield Mining Co.'s mine, the Last Chance, near White River, under Superintendent Anderson, a shaft has been put down 200 ft. and two levels are being run from the bottom of the shaft.

Tuolumne County.

The Mack mill, near Big Oak Flat, has been started. —— Grading at the Longfellow mill, near Big Oak Flat, for an additional 10 stamps, is being done for a 25-stamp mill.

The south shaft of the New Albany mine, north of Carters, is to be opened. As soon as the water has been taken out of the shaft a power pipe line will be put in. The property was lately deeded to Chas. Y. De Lay.—— The shaft of the Black Hawk mine, near Soulsbyville, will be sunk to a depth of 180 feet.

COLORADO.

(Special Correspondence).—The State Supreme Court has dissolved the injunction granted by Judge Owers of Leadville in the case of the Western Federation of Miners against the Mine Operators' Association of the Leadville district, enjoining the operators from enforcing the card system. The injunction is dissolved until the court can pass upon the merits of the case. The card system as employed in several camps of the State is to the effect that no one shall be employed in or around the mines without the party first registering with the Operators' Association and receiving a card, which permits them securing employment. This has been considered a rather vicious measure adopted by the operators, but they claim it is to get rid of, as far as possible, the disturbing elements usually found in the districts. The system is said to be in successful operation in the Cripple Creek and Telluride districts, and will probably be enforced in Leadville.——With the exception of the San Juan district the snowfall throughout the State is below the average for this time of year.

Denver, Jan. 15.

Boulder County.

(Special Correspondence).—Mining in this district is improving and during the coming summer a large amount of development work will be accomplished. The tunnel in the old Brunswick property is to be driven 250 ft. farther.——The New York Mining & Milling Co. intend driving their tunnel 1,000 ft. farther. This mine is equipped with power plant.——The Wano recently made a good strike of calaverite, which is the first strike of the kind made for several years.——On the Invincible a good streak of high-grade free gold ore was recently opened up.——The Copper Blush intend sinking their shaft 200 ft. deeper. The work was started by contract but was abandoned and now will be done by day's work. ——The Buchanan is being opened up by Philadelphia people.——The Standard people expect to start operations on the blanket vein on their property. It is reported a 100-ton mill will be put on the property.——The Ellen mine has been opened up by leasers, who are sinking. ——The Boulder Reduction Co. is completing tests on the Red Spruce ore and doing custom work in the mill on ore mostly from the Invincible mine.——A large tunnel scheme is now under way for this district, and consolidation of several properties is being considered.—— The shipping of fluorite to the steel works at Pueblo has again commenced. This is the only deposit known in the State that will pay to ship.

Jamestown, Colo., Jan. 11.

Gilpin County.

The American Tungsten & Mining Co. has secured a two-year bond and lease on the Walter A. No. 1, 2 and 3 claims in the Kansas district, north of Boulder park, near Central City.

Gunnison County.

A controlling interest in the Camp Bird property at Bowerman has been sold by the Gold Cross Mining & Milling Co. to F. A. Wilson and Boston capitalists for $35,000. The Camp Bird group embraces 200 acres and is ore of the first discoveries in the Bowerman field.

Lake County.

(Special Correspondence).—A. V. Bohn, who has been operating in Big Evans gulch, is reported to have opened up good ore on the 500-ft. level. It is believed this strike will be the means of much activity in this locality.

Leadville, Jan. 13.

It is planned to put in an electric plant to be run by water power from Willis gulch, near Twin Lakes, to run the air compressor and contemplated mill of the Manhattan mine.——Rich gold-copper ore is reported to have been struck in the Highland Boy claims, on Bull hill, by H. Medaris and F. Ryan of Twin Lakes.

After putting a pump at the 550-ft. level, the Mammoth shaft, in Big Evans gulch, Leadville, has resumed sinking. Water is coming in through the lime.——The Dome shaft, Rock hill, is sinking another lift. The shaft is down 85 ft. below the 200-ft. level.

Ouray County.

The Colorado Supreme Court has handed down another opinion on the mining tunnel question, in the case of Frank P. Tanner *et al.* against the Treasury Tunnel & Reduction Co. of Ouray. The case involves the right of one mining company to tunnel through the property of others. The Supreme Court held that this right exists under the law of eminent domain. It went even further and said that a tunnel so constructed may be used by other companies as a sort of quasi-public highway. Parties causing the construction of such a tunnel must pay the owners whose property it pierces for the ore taken out, and parties using such tunnel afterward must pay a reasonable sum for such privilege. The Treasury Tunnel, Mining & Reduction Co. wished to bore through the Corn Cob lode, owned by the plaintiffs in error. Litigation followed, which resulted in its favor, and an appeal was taken. In the decision Chief Justice Gabbert wrote: "For the development of the mining resources of this State, tunnels of the character contemplated by the petitioner are necessary. The necessity of vesting corporations of the character of petitioner with the right to exercise the power of eminent domain is apparent, for without this enterprises of the nature contemplated by the petitioner could be thwarted and the development of the mining resources of the State prevented. The use and benefit of this tunnel will be in common, and all parties located near may avail themselves of it."

San Juan County.

At the Fairview and Thunder mines, on Sultan mountain, south of Silverton, under the supervision of George H. Bibb, the tunnel is being driven to intersect the Fairview vein.——According to Superintendent T. R. Hennahan, the North Star mill, on Sultan mountain, south of Silverton, may be started the first of February. The Belcher vein, upon which they have been driving for three years, will soon be reached. In the meantime drifting on the Eunice, Sound Democrat, O'Neill, Washington and Jefferson veins is progressing and good milling ore is being stacked on the dump.

The new zinc separator at the Sunnyside mine, near Silverton, has been completed and is in operation. The mill is equipped with the magnetic separators, which are producing zinc concentrates. The Sunnyside mines have been sold to the Ross Mining Co., who will take charge February 1.

San Miguel County.

M. Mongrandi has taken a lease on the No. 1 level of the Butterfly-Terrible mine at Ophir Loop. His product will be treated at the company's mill by the company. The company has stopped work on their lower tunnel, with 100 ft. to run before cutting the vein. A number of small leasers are working in the lower levels. ——John W. Wagner is constructing an aerial tram 700 ft. in length from the mouth of the tunnel on the Bradley to the Cimarron mine, near Telluride. The Cimarron mill is being remodeled and will be fitted with 40 1,360-lb. stamps and have a capacity of 500 tons per day. It will be run on Cimarron and Bradley ore.

Teller County.

A strike is reported on the Mary Nevin claim, on Rosebud hill, near Victor. The ore shoot opened in the Banner six weeks ago has been found in the Mary Nevin at a depth of 300 ft.——At a depth of 400 ft. in the No. 2 shaft of the Stratton's Independence, in the Russell lease, a gold discovery has been made.——John Sharp of Cripple Creek has secured a lease on the Rose Maud claim, on Raven hill. The shaft is 240 ft. deep.——The Acacia Gold Mining Co. of Cripple Creek have elected the following officers for the ensuing year: K. McKenzie, president and manager; W. J. Chinn, vice-president; K. McDermid, secretary and treasurer. Lease on the South Burns ground was issued to H. H. Clark and associates of Cripple Creek. The lessees are required to continue the shaft to the 1,000-ft. point within eighteen months, which means the addition of 550 ft. Contract for 300 ft. of this work has been let and work will begin at once. The lessees are also required to pay a royalty of 30% flat on all ore shipped. Management of the leasing company has been placed in the hands of C. N. Crowder.

General Manager C. M. Becker of the Stratton's Independence, Ltd., has given notice to all of the 36 sets of lessees now operating that the present blocks are to be cut in two. The other 36 blocks will then be leased, making the company have more lessees than any other property in the camp. The size of the blocks heretofore has been 300x600 ft. The new order goes into effect February 2, at which time all leases expire. This company, since it inaugurated the leasing system, has only given leases for a period of six months. The Stratton's Independence is maintaining a heavy tonnage of ore and the average value is good. The 36 sets of lessees shipped out during December 3,000 tons of ore and the value per ton on an average was $35. The company has considerable ground that has not been exploited and the new lessees will probably do this work. The mine has been a success under the leasing system.

The big strike of ore recently made on the south end of the Dante, at Cripple Creek, by Becker & Briggs, has proven permanent. The ore was found in the lower Trail tunnel, 475 ft. below the surface. They have opened up a chamber of ore that appears to be the junction of the vein. It is 20x20 ft. in size, with ore showing on every side, as well as in the roof and floor. The lessees intend to make an upraise of 150 ft. to connect with a winze sunk from the surface. When the raise is made machinery will be put in and sinking started in the ore below the Trail tunnel level. A depth of 200 ft. will be made immediately. A motor car is to be put in to haul the ore out of the tunnel, as the rock is being broken at over 2000 ft. from the portal.

IDAHO.

Robert N. Bell, State Inspector of Mines for Idaho, gives the following estimate of the gross metal contents of concentrates and crude ore shipments from Idaho mines during 1905: Gold, 61,694 oz., value $1,275,214.98; silver, 9,009,230 oz., value $5,432,565.69; lead, 262,631,632 lb., value $12,868,449.96; copper, 6,670,000 lb., value $1,040,520; zinc, 2,150,000 lb., value $124,700; total, $20,741,950.63.

Ada County.

The Equitable Mining & Milling Co., which is developing claims in the Black Hornet district, near Boise, is driving a crosscut tunnel. Superintendent B. B. Jones has given orders for a tank for a cyanide plant to be put in for experimental purposes. There will be three of these, of 50 tons capacity each. He has also ordered the pumps needed for the plant.

Idaho County.

The Seattle & Idaho Co., of Dixie, is preparing to put in a 60-ton concentrator to replace the present 4-stamp mill. The ore has been found amenable to the cyanide process.

C. W. Smith reports the Anaconda mine, at Newsome creek, to have been operating a 5-stamp mill since Nov. 5 and that it is making regular cleanups which show good results. The mine is owned by the Graham-Ross Co.

Kootenai County.

New hoisting machinery has been purchased and delivered and considerable development work is being done on the property of the Lane Gold Mining Co., one mile east of Lane, on the Tekoa-Burke branch of the O. R. & N.

Latah County.

A. J. Hoskins of the Muscovite mica mine, 15 miles east of Troy, intends working 75 men in the spring.

Shoshone County.

It is expected that the Helena-Frisco mine at Gem will resume operations with 200 men. Gus Ehrenburg has men arranging to pump the water from the mine, preliminary to beginning mining operations. There are about 1,300 ft. of water in the mine. It will take three months to pump it. The owner ceased working it two and a half years ago. Since then the upper levels have been worked under a lease.

The tailings case, in which farmers living in the Cœur d'Alene River valley are suing for an injunction against the various mining companies operating concentrators, to restrain them from permitting the tailings from their plants to flow down the stream to the alleged detriment of the plaintiffs' lands, has been transferred to Cœur d'Alene City. The case has been on hearing before Judge Warren Truitt of Moscow, who was appointed by the Federal Court as master in chancery to take evidence. At Cœur d'Alene City, Dr. McBurney, State veterinarian at Boise, Idaho, and Dr. Bell, Government veterinary surgeon for British Columbia, will be the chief witnesses. Not only do the plaintiffs in the case allege damage to their lands and crops, but they claim that horses belonging to them have been lost through the animals drinking the alleged lead polluted water of the river.

C. F. Smith of Black Bear, who secured a new lease on the three upper tunnels of the Custer mine, is driving a crosscut from the No. 2 tunnel, 1,450 ft. in from the portal, in an effort to locate a lost ore-shoot.—— M. J. Sinclair, W. H. Kane and George Mason, owners of the Surprise mine in the Pine Creek district, near Wallace, will open up the orebody found in the No. 2 tunnel by drifts both ways on the vein, and will probably equip it with a small mill.——At the Leslie mine at Wallace the orebody is being drifted on at a depth of over 700 ft., the ledge having been cut by the tunnel 1,500 ft. from the portal and 500 ft. beyond the No. 1 ledge.

New hoisting machinery is to be put on the Keating property at Wardner.——John Thyne, manager of the Golden Chest mine at Murray, states that the development tunnel started is in 2,400 ft., and is 200 ft. from a point vertical to the Sullivan shaft above.——The Alma Mining Co., on Deadman gulch above Mullan, has resumed operations.

The Hecla Mining Co. has received a part of its machinery for the mill at Gem.

Richard Daxon will sink the winze of the Tarbox mine, near Wallace, from the 400-ft. level to the 600-ft. level. A crosscut will then be made to the orebody.—— The Alameda Mining & Milling Co. is planning to resume the development of its property, near Wallace.——The Morning mill at Mullan has added several vanners to its equipment since the Federal company took over the property and new tailings elevators are to be constructed. These improvements are being made under the direction of George Ruggles. The vanners will save slimes and fines which formerly went to waste. The Morning mine is employing 350 men.

Washington County.

It is stated that preparations for resuming operations at Mineral by the Ladd Metals Co. are about completed, and that a force to work the mines and smelter will be put to work soon.

MICHIGAN.

Houghton County.

(Special Correspondence).—The new shaft of the Tecumseh has reached a depth of 200 ft., and a plat is being cut for drifts at that depth. The shaft is partly in the foot-wall, and no crosscutting has been done to test the lode from wall to wall.——The Osceola management has reverted to the former plan of mining the Osceola amygdaloid as a bunchy proposition, instead of taking practically everything between walls, and the result is apparent in a largely increased percentage of copper secured per ton stamped. The copper is found in bunches, and favors the hanging wall as a rule, but frequently occurs in parallel bunches of rich ground upon both the hanging and foot-walls. As a consequence of this peculiarity of copper occurrence, drifts are carried well toward the hanging, and stoping is done only in the rich ground. This plan reduces dead work in unproductive ground to the driving of a 7 by 7 ft. drift, as compared with the former heavy expense of breaking practically all the rock from wall to wall. The plan of reaching the foot-wall bunches has been, heretofore, to crosscut to the foot from each rich bunch found on the hanging, but this method is to be displaced by diamond-drill borings. An average crosscut from the hanging-wall drift to the foot-wall costs $90, while a drill hole can be bored for an average cost of $30.——The rebuilding of the third section of the Calumet & Hecla mills is well along, and work on the fourth and final section will be undertaken shortly. The remodeling of the two old mills should be completed in 1907, and when the work is done, after four years of steady effort, the company will have three stamp mills, modern in construction and equipment, capable of crushing 10,000 tons of conglomerate, or 15,000 tons of amygdaloid daily. There will be 29 power stamps, of which number one or two will be reserved for experimental purposes, and probably two or three others will be held as auxiliaries, to replace stamps temporarily out of commission. Each of the Calumet & Hecla steam stamps is equal, in crushing duty, to 125 modern gravity stamps of the sort used in milling gold ores. The new mills of the Calumet & Hecla will be equal to a modern gold mill with 4,000 stamps.

Houghton, Jan. 15.

MONTANA.

Beaverhead County.

The Duluth Company, which is operating the Copper Queen in Idaho, over the line from Midway, has a lease and bond on the Park, Old Elkhorn, Washington and Park Extension in the Elkhorn district. They will begin work on the Wise river side of the range and run a tunnel 2,500 ft. to tap the claims at a depth of 4,500 ft. Power will be secured from an electric plant on the Wise river.——T. Taylor, of Dillon, has secured an option on the Blue-Eyed Nell claim, owned by F. B. Williams and T. Haw. This claim is in the Elkhorn district.——At Polaris, the new company has the frame of its smelter constructed and ore bins completed. The company is also operating the Silver King, an iron mine on the hills north of the Polaris. It has a 14-ft. vein of magnetic iron, and will be used in fluxing. Water has recently been found in the shaft in such quantities that a pump will be required.——Encouraging reports come from the Blue Wing district of Beaverhead county. The district is between Bannock and Argenta.——On the Brick Pomeroy, A. Bessette has seven men at work taking out shipping ore.——In the New Departure mine, in the same district, John Marsh and W. A. Jones are leasing and are shipping ore regularly. An air compressor and pump are to be put in.——An effort is being made to have the old Iron Mountain mine in the Argenta district worked. It is owned by the St. Louis Smelting Co. and John Cowan has a lease on the property.

Fergus County.

C. H. Walker, of London, is expected to resume the management of the New Mines Sapphire Syndicate's property at Yogo. Last fall I. F. David was awarded damages against this company for $1,000 for injury done his land and crops through the slums from the mines being carried upon his ranch in the waters taken from the Judith river for irrigating purposes. The ditch carrying waste from the mines empties into the Judith above the intake of the irrigating canals, and under this arrangement, the ranchers below the point of discharge cannot avoid carrying much of the waste upon their lands. On the trial, an injunction was granted restraining the sapphire company from discharging its waste into the river at the point stated. The washing will commence early in the spring. Much work is being done both at the mines of the syndicate, and at the Burke & Sweeney ground, which is now under bond to the American Sapphire company, of New York, for $100,000. The mining operations are being pushed with full forces.

NEVADA.

Elko County.

A snowslide at Edgemont swept away a large quartz mill, completely wrecking it and carrying away bullion which was on the plates. The machinery is being uncovered by a large force.

Esmeralda County.

Additions are being made to the two stamp mills operated by the Mohawk-Alpine company, at Silver Peak ——Bert H. Hummel, manager for the Lida Gold Mining Co., states that a shaft will be sunk on the ledge which was cut in the crosscut tunnel.——The New Western Reduction Co. has placed an order for a new sampling plant, a new 40-stamp mill and a chlorination plant, and plans to have the mill complete and in running order by the first of May.——The Gardner Mining Co. will build a cyanide plant with a capacity of 40 tons per day. Construction work will commence about the middle of January.——New machinery has been added at the American mill at Goldfields.——Ten more stamps, a Bry-

an mill, three vanners, a Wilfley, a 40-ft. tube-mill and three slime-tables are being added to the plant of the Combination Mining Co. at Goldfields.——The Kinkead mill, under construction on the east side of Columbia mountain, will be in running order by the middle of February.

Eureka County.

It is reported that a 50-ton smelter is to be put in to treat ore from the Mineral Hill mine at Palisade by G. L. Kennedy.

Lincoln County.

Material has been purchased by the Good Springs Smelting & Development Co. for the construction and equipment of an electric railway 12 miles long, to run from Good Springs to a mining section north of that city. This will bring ores from the mines and carry workmen to and from their homes.

Nye County.

At the Montana-Tonopah mine, at Tonopah, men are excavating for the new compressor, hoist and steel gallows-frame. The steel gallows-frame is to be put up around the present one and will be completely connected up without disturbing the latter.——The Tonopah Mining Co. has completed its motor drives for its compressors and is using air drills in all its workings.

White Pine County.

The Gold Canyon Mining Co. is running two drifts on the level from the tunnel level at its mine at Cherry creek.——The work of unwatering the Ruth mine at Ely is finished. Arrangements are being made to put 80 men at work.

NEW MEXICO.

Grant County.

The Silver City, Pinos Altos & Mogollon Railroad—a narrow-gauge line that is being built from the Comanche smelter at Silver City to Pinos Altos—is almost completed. In February ore trains will be running over the line.——The Comanche Mining & Smelting Co. is again enlarging the capacity of the smelter on the site of the old Silver City Reduction Works, destroyed by fire two years ago. A reverberatory and blast furnace are ready to be blown in. Ore-bins having 5,000 tons capacity have been built. Construction has been begun on a concentration mill to have 400 tons daily capacity. The zinc concentrating department has contracted its product at $60 a ton for 1906. To handle the copper-silver-gold concentrates, a briquetting plant has been put in. Orders have been placed for magnetic ore separators. The new 250-ton furnace will be blown in early in February. Another furnace of the same capacity is to be constructed this year, after which the old furnaces will be dismantled.

Luna County.

The Phœnix Prospecting Co., in the Cook's Peak district, has taken a bond on several properties.

Otero County.

The Southwestern Co. is opening new ore on the By Chance property at Jarilla. A crosscut will be driven from the bottom of the By Chance mine shaft to get under this orebody.——A tramway is to be built from the Lucky Mine tramway at Jarilla to the other mines and dumps.

Sandoval County.

The United Verde Mining Co. of Jerome, Ariz., has bought the rolls, shafting, Corliss engine, piping, rails, cars and other machinery and equipment of the Albemarle Mining Co., in the Cochiti district, for $18,000. The machinery is to be freighted to Thornton and shipped to Jerome.

Socorro County.

William S. Bourne and L. R. Lamy of Nogal are interesting Kansas capitalists in several zinc and lead propositions in the San Andreas mountains.

OREGON.

Baker County.

C. G. Green, of Durkee, has sold to C. W. Thompson, of Portland, and F. T. Sutherland, of New York, the Blue Bucket, Marcus Daly and Golden Gate quartz claims and the Golden Gate placer claim, with valuable water rights. These properties are in the Burnt river mining camp and are near the Gold Coin mine, 26 miles southeast of Baker City.

The Taber Fraction mine at Bourne is employing 42 men in the mine and at the mill. The Cracker-Oregon mill, which has been leased by the Taber people, has been overhauled and new machinery added, and has for several weeks been kept treating the Taber Fraction ores.——The Golconda, near Bourne, has opened a large body of ore. The mill is being overhauled and new machinery will be added.

Josephine County.

The Buckeye Mining & Smelting Co. has begun development work on the Buckeye mine of the Slate Creek district, near Grants Pass. The company is building a wagon road to the mine. A compressor is being placed.

Manager C. Hoofer of the Mt. Pitt mine on Jump-off-Joe, near Grants Pass, states that he will put in a compressor and power drills at the mine in February.——A 5-stamp mill is being placed on the Higgins mine in the Chetco district.——S. G. Adams, general manager of the Capital City Gold Mining Co. at Sacramento, Cal., which owns the Baby mine, eight miles north of Grants Pass, is at the mine arranging for additional development work.

Lane County.

President Zimmerman of the Lucky Boy mine, near Blue River, says that within 60 days the deep crosscut on the mill level will be completed and the ore will be delivered at the mill.

SOUTH DAKOTA.

Custer County

It is reported that the Lilian Bald Gold Mining & Milling Co. will start a three-compartment shaft to develop their claims near Custer. C. E. Perrin is secretary.

UTAH.

The annual report of State Coal Mine Inspector Gomer Thomas recommends the passage of a law that will regulate the use of high explosives in coal and hydrocarbon mines during working hours and to limit the period for using explosives to the time when all employees are on the surface except those actually employed in firing the shots. Men employed in the mines are allowed to use explosives which cause the air in the mines to become vitiated by the unnecessary use of powder for blasting off the coal. In some mines they are shooting and using powder throughout the day. The great source of danger is in the free use of powder, such as blown-out shots, etc., and nearly all explosions come through this source, especially when a mine is dry and dusty. The year 1905 was the most prosperous for all interested in mining coal of any years since mining commenced in Utah. It would have been more prosperous if the railroads had had sufficient equipments to handle the coal, while the mine officials, owing to the scarcity of miners, could not comply with the great demand for coal. The number of accidents, while low in comparison with other States, is no doubt much higher than it would have been if the workmen were of a more careful class and were able to co-operate with their employees in efforts to provide for their safety. The report shows that the total production of coal during the year was 1,602,528 tons, an increase of 39,254 tons over 1904. The output of coke was 215,712 tons, an increase of 30,695 tons over the preceding year. The coal production during 1905 was distributed among counties as follows: Carbon, 1,444,565 tons; Summit, 74,911 tons; Sanpete, 4,202 tons; Emery, 3,500 tons; all other counties, 75,350 tons. The value of the coal is placed at $1,890,982, an average of $1.18 per ton on cars at the mine. The report shows that 1,963 men were employed in the coal mines and worked 2,376 days. Fatal accidents numbered seven, and other serious accidents, 36. The mines used 150,642 lb. of powder and 83,692 lb. of dynamite. Horses and mules to the number of 167 were employed in the mines. Fifty steam boilers and two locomotives were used. Coke ovens in operation numbered 754. Employees of the Utah Fuel Co., the leading producer, are classified according to race as follows: Americans, 879; Germans, 54; Finns, 157; Italians, 171; Austrians, 260; Swedes, 7; Frenchmen, 16; Greeks, 111; Slavs, 3; negroes, 14; Mexicans, 2; Japs, 46.

Beaver County.

The Moscow mine, in the Star district, near Milford, is being worked under the direction of Superintendent Ferguson.——Silver ore is being taken from the Talisman mine, near Milford. The bottom of the shaft at 425 feet is in ore.

Grand County.

Preparations are being made by the following companies for starting work near Basin in the spring: The Tornado will be developed and its product treated in the Basin stamp mill; also the Florence, on Mineral mountain, and the Michigan property, on Castle mountain. The High Ore and Skylark properties are being put in shape for developments by the new companies. The Grouse Mountain Co. will start up and continue their tunnel to tap the gold vein for which they have been tunneling for the past year. The Boston & La Sal Co., in Beaver Basin, are doing preliminary development work to open up the Beaver Basin and Deep Creek mines.

Morgan County.

M. A. Dougherty, manager of the Carbonate Hill mine, near Peterson, is preparing to increase work at the mine.

Juab County.

Most of the leasers at the Eureka Hill mines, at Eureka, have been granted renewals for an indefinite time.——It is expected that the Godiva mill at Eureka will be ready for work by March 1.

Salt Lake County.

A 40 h. p. hoist has been ordered for the Bingham Mary mine at Bingham by Manager S. M. Bamberger. The steel gallows frame is expected to be completed by March 1.

Tooele County.

Superintendent Jones, of the Sacramento mine, at Mercur, reports that a new body of cinnabar ore has been cut 500 ft. away from the body last found. The new body of this ore was found by means of an incline 150 ft. in depth on the tunnel level.

Wasatch County.

According to the Salt Lake *Tribune*, the miners and prospectors wintering on the North Fork of the Duchesne in the former Uintah Indian reservation have organized a district to be known as the North Fork Mining District. They have received letters from people in different mining camps in Nevada, Utah and Colorado who desire to come to the North Fork district this winter, and asking for information regarding the camp and the climatic conditions. The men in the North Fork want to discourage any attempt to create a stampede into the camp this winter, as it would only result in disaster similar to that of Thunder Mountain. The conditions on the North Fork are very unfavorable to winter prospecting. The snow lies three and four feet deep in the mountains, and the storms at times are severe. It is impossible to prospect when one cannot see the ground, and living in a tent at this time of year would entail privation. The valley of the North Fork is at an altitude of about 7,300, but the mountains rise abruptly from the river and attain a height of 12,000 ft. in seven miles. There are about 15 men wintering on the North Fork, but they have been there since the opening of the reservation last August, and have made adequate provision for the winter. The district is 21 miles from north to south and 24 miles from east to west. Most of the locations made to date are within four or five miles either side of the valley of the North Fork in places most easy of access. Heber, on the Denver & Rio Grande Railroad, is the gateway to the North Fork; from there to Woodland is 16 miles; thence 26 miles to the district. The road at the present is in very bad condition and impassable on the summit, but it is probable that the people of Heber will improve the road by spring. The summit of the West Fork pass, down which the road comes, is at an altitude of 9,000 ft. and covered covered with about four feet of snow in winter. A road will be built in from Park City, about 45 miles away.

Weber County.

The Utah Smelting Co. is incorporated for 100 years with a capital stock of $500,000. The principal place of business of the company will be Ogden. The officers of the company are David Eccles, president; Bela Kadish, vice-president; Charles W. Nibley, secretary, and John Pingree, treasurer. The company intends building a smelter near Hot Springs, 10 miles north of Ogden.

WASHINGTON.

Ferry County.

The owners of the Knob Hill and American Flag properties, on the Kettle river, two miles from Hughes Siding, and 19 miles from the Granby smelter, have closed down the mine for the winter, but development will start again next March.

An air compressor has been put in at the Oversight mine, on Belcher mountain, near Republic.

Okanogan County.

(Special Correspondence).—The Ruby Mining Co. is developing veins carrying sulphide of antimony on Mount Chapaca, four miles south of the British Columbia boundary line. The group comprises the Argentite, Pyrargyrite, Mystic Shrine, Beggar's Choice, Hide and Seek, Labyrinth, Crescent and Homer. There are several veins on the group. The value is in silver and copper. The company has shipped 130 tons of ore and 26½ tons of concentrates. The wagon transportation to the railroad cost $2000. One carload went to the Tacoma, one to Nelson, B. C., and two to the Everett, Wash., smelter. The Ruby Company began work in January, 1903, and has operated continuously since. A main working tunnel started above the level of the Similkameen valley cut the Ruby vein 950 ft. from the portal and is now in 1,060 ft. and being driven ahead for other veins. Drifts have been started on the Ruby vein. A sampling mill is to be put in when the Victoria, Vancouver & Eastern Railway is finished.——The Rainbow mine, on Palmer Mountain, has been sold to J. J. Bennett, Fay Harris and John Woodward.

Loomis, Jan. 13.

George W. Hedges of Spokane is making preparations to work the Capital Mining Co.'s property on Palepick mountain, five miles from Twisp. Mr. Hedges proposes to sink 100 ft. deeper. The shaft is down 65 ft.——The Washington-Calumet Mining Co. are building cook and bunk houses, blacksmith shops and ore bins on its property on Goat creek, north of Twisp. S. S. Callahan, manager, is superintending the work.——The Skylark Mining Co., a Spokane corporation, owning property one-half mile south of Twisp, are pushing work. John T. Holley has charge.——The Spokane mine, a galena property, two miles east of Twisp, is working.——Hotchkiss Bros., owners of the Cherry group, on Lookout mountain, are driving a long tunnel to crosscut their ore body at a depth of 600 ft. Boswell, McClure & Jones, owners of the Humboldt group, have found good ore in their crosscut tunnel.

Pierce County.

At the Tacoma smelter an additional bag-house for lessening the waste from the lead furnaces is being built. The wharfage is to be enlarged and dredging operations undertaken for accommodating more vessels at the company's docks. A 60-ft. extension will be built to the copper refinery to make room for 64 additional tanks, for another reverberatory copper-casting furnace for melting cathodes, blowing engines, electric motors, etc.

Skagit County.

The Cascade Consolidated Mining & Smelter Co. has made the preliminary survey for a railroad to connect with the Great Northern, which will enable the company to ship its ore direct to the Everett smelter without change of cars. This road is in the heart of the Cascade and Stehekin mining districts and will furnish an outlet for the product of more than 150 mines.

Stevens County.

C. Fleugel has sold the Anaconda and the Copper King mines, on the south slope of Red Top mountain, eight miles southeast of Boundary City, to John Keough, of Colville, for $60,000.

Work has commenced on the Jay Gould mine, at Chewelah, which was recently bonded by H. W. Wright and G. H. Walters. Drifting will be done on the 100-ft. and 180-ft. levels.

Whatcom County.

At a meeting of the Great Excelsior Mining Co. directors in Seattle, at which S. E. Moore of Philadelphia was chosen president, it was determined not to operate the mine until it had been learned whether a smelter will be built on Bellingham bay.

WYOMING.

The output of the metal mines of Wyoming during 1905 was not as great as during several preceding years. The iron mines lead in the value of product with a production of 250,000 tons, valued at $425,000. The greater part of this output came from the mines of the Colorado Fuel & Iron Co., at Sunrise, and was shipped to Pueblo, Colo., for reduction. Of copper, there was produced 2,000,000 lb., valued at $320,000, nearly all of the product coming from the Ferris-Haggerty mine in Carbon county. The gold production is estimated at $30,700, and the silver at $32,528. During the last two months of the year several gold discoveries were made. A rush of prospectors started to Copper mountain, in Big Horn county. At Camp Kirwin, Big Horn county, development work was done during the year on gold lodes. There was little activity in the South Pass field. Practically all of the gold mined in

the State during the year came from this district, however. With the advent of the railroad in the summer of 1906, the low-grade gold deposits will be opened. During the year the C. F. & I. sank a four-compartment shaft to the depth of 400 ft. on the Chicago iron deposit, near Sunrise, and the mine is now producing several hundred tons of ore daily and will produce 1000 tons daily in 1906. The C. F. & I. has also purchased the Rawlins iron mine, which will be developed during the coming year. During 1905 iron deposits of vast extent and value were discovered in the State, one corporation alone securing 30,000 acres of iron lands. A majority of the discoveries are remote from railroads and can not be placed on a commercial basis under existing conditions. Steady development work proceeded in the Grand Encampment copper district during 1905, and a number of properties there will become producers during 1906, when two railroad lines will penetrate the district. The capacity of the Grand Encampment smelter, which is 30 miles from a railroad at this time, is to be increased.

FOREIGN.

AFRICA.

Rand.

The production of gold at the Rand in December is officially announced at 431,594 fine ounces, compared with 424,757 fine ounces in November and 362,264 ounces in December, 1904. The preliminary estimate placed the production last month at 435,000 fine ounces.

AUSTRALIA.

Victoria.

The first mine in the Commonwealth to sink its shaft 4,000 ft. is the New Chum Railway at Bendigo. There are workings at a greater depth, but this has been made up by winzes. The New Chum Railway have a winze down 4,226 ft., and that of the Victoria Quartz is over 4,100 ft. deep. In the case of the New Chum Railway, there is now a straight shaft from the surface to the bottom at 4,005 ft. The shaft is being sunk to make a connection with the winze, and when this is done the cage will have a direct run through the shaft of over 4,000 feet.

The Victorian Government having been fully recouped the £20,000 expended on the purchase of the cyanide patent rights, so far as the State is concerned henceforth the cyanide process may be employed without charge in Victorian mines. The company holding the patent claimed a royalty of five per cent for use. The State Government charged half that amount until the sum of £25,000 was raised, when the process became free.

CANADA.

BRITISH COLUMBIA.

Boundary District.

W. C. Thomas, smelter superintendent of the Dominion Copper Co., has blown in the second furnace of that company's reduction works at Boundary Falls, which makes every smelter in the Boundary now operating a full battery of blast furnaces—12 in all—except when some minor repairs are going on. Eight of these furnaces are at the Granby smelter, two at the British Columbia Copper Co.'s and the other two at the works of the Dominion Copper Co.——Boundary ore shipments for the week ending January 13 were as follows: Granby mines to Granby smelter, 18,252 tons; Mother Lode to British Columbia Copper smelter, 2,080 tons; Brooklyn-Stemwinder to Dominion smelter, 1,770 tons; Rawhide to Dominion Copper smelter, 450 tons; Sunset to Dominion Copper smelter, 450 tons; Emma to Nelson and British Columbia Copper smelter, 276 tons; Oro Denoro to Granby smelter, 99 tons; Providence to Trail smelter, 60 tons. Total shipments for the week, 23,437 tons; total for 1906, 29,120 tons. Boundary smelters treated: Granby smelter, 16,976 tons; British Columbia Copper smelter, 2,665 tons; Dominion Copper smelter, 2,670 tons. Total treatment for week, 22,311 tons; total for year, 32,572 tons.

Nelson District.

It is announced that the zinc smelting plant at Frank will be doubled in capacity, from 60 to 120 tons a day. The work should be completed within the next two months. The plant owns its own coal, quarries it out at the back of the works and converts it into gas, which is used in the retorts. These are manufactured by the company, which is thus a pottery plant as well as a gas works and a zinc smelter. A rate given by the Canadian Pacific Railway for zinc ores from all points in the Slocan, Lardeau and Ainsworth districts is $2.25 a ton, as against the $10 a ton freight charged to Iola.

Rossland District.

The output of the Rossland mines for 1905 was 315,000 tons, valued at $3,780,000. The output for the 12 years past since and including 1894 is 2,314,893 tons, of which the estimated value is $33,490,141.——In Le Roi mine the Black Bear shoot has been found on the 900-ft. level and on the 1,000-ft. level. The section between the 1,350 and the 1,550-ft. levels has been explored with good results during the year, and recently a contract was let to deepen the winze from the 1,550 to the 1,750-ft. level.——In the Center Star the main shaft has been deepened 300 ft. below the ninth level to the eleventh level, opening a portion of the mine which is known to contain some valuable ores-hoots.——At Le Roi No. 2 an important work is the exploration of the ground of Le Roi by means of a crosscut. In the War Eagle the development work and the diamond drilling have led to the finding of some important ore bodies.——The White Bear has developed an ore-shoot on the 700-ft. level.——The Spitzee, with ample funds, should be made a mine during the present year.——The Jumbo has continued steadily during the past year.——In the matter of concentration the progress made has not been satisfactory. Le Roi No. 2 concentrator has been run steadily. Le Roi Mining Co. erected an experimental concentrating plant and only fairly satisfactory results were obtained from it. It was closed down. The White Bear concentrating plant was operated up to the time the mine was shut down in May, and will be operated this year as soon as the mine re-starts, which will be some time this month. The output of ore shipped from and crushed at the Rossland mines during the year ended December 31, 1905:

Mine.	Tons.
Le Roi	110,838
Le Roi (milled)	2,856
Center Star	95,550
War Eagle	61,500
Le Roi No. 2	10,451
Le Roi No. 2 (milled)	11,131
Jumbo	10,729
Cascade-Bonanza	150
White Bear	1,100
White Bear (milled)	3,229
Crown Point	350
Spitzee	4,809
Velvet-Portland	1,977
Gopher	180
Homestake	30
Lily May	90
Inland Empire	30
Total for year	315,000

Ore was shipped as follows from the Rossland district for week ending Jan. 6: Le Roi, 1,410 tons; Center Star, 1,710; War Eagle, 1,230; Le Roi Two, 570; Jumbo, 200. Total, 5,120 tons.——The station on the 11th level of the Center Star has been cut out, and crosscutting to the ledge is in progress. The 11th level is 1,530 feet below the collar of the shaft, but the determination is to go to still lower levels. The work of deepening the shaft from the 11th level will begin as soon as the crosscut to the ledge is completed. Development is in progress on the 11th, 10th, 9th, 8th, 7th, 5th and 4th levels.

J. E. Sorbin has sold the St. Paul to W. R. Brock of Toronto. The company is to be reorganized to resume operations. The St. Paul in on the Red Mountain Railway, west of the Whitebear.——The output for the week ending January 13 was: Le Roi, 1,680 tons; Center Star, 1,950 tons; War Eagle, 1,020 tons; Le Roi, 420 tons; Le Roi No. 2, milled, 1,200 tons; Jumbo, 200 tons; total for week, 6,470 tons, and for the year, 11,590 tons.

Slocan District.

The Trail smelter received 6,656 tons; Hall Mines smelter 273, and Marysville smelter 300 for the week ending January 13. The Slocan shipments were 1,081 tons, and for the year to date 2,433 tons. The chief shippers were: St. Eugene, 410; Sullivan, 300; Eureka, 103; Queen, 44; Arlington, Slocan, 30; Pioneer, 30; other mines, 267.

Vancouver Island.

(Special Correspondence).—The Tyee Copper Co's. smelter ran 11 days and treated 2,035 tons of Tyee ore during December, giving a return, after deduction of freight and refining charges, of $33,460.10.

Duncans Station, Jan. 12.

MEXICO.

Because of foreigners claiming that they had not been given proper protection from Indian outrages in Sonora and Lower California, it is reported that the Mexican Government has issued an order forbidding mining agents in those States to allow foreigners to file mining claims.

Chihuahua.

It is understood that the Barranca de Cobre copper mines, in the Barranca de Cobre district, will commence shipping concentrates as soon as the Orient Railroad reaches Cuesta Prieta. The concentrating plant at the mines was started up Dec. 1. H. T. R. Cowell is the general manager.

Coahuila.

The Compania Carbonifera de Sabinas, S. A., organized in Monterey a few months ago to exploit the coal beds at San Juan de Sabinas, which that company has under lease, is arranging to operate the mines upon a larger scale.

Colima.

The El Mamey Iron Co., organized in Duluth to work iron deposits in the municipality of Villa de Alvarez, will start development work this month. The company intends to utilize the waters of the Mamey river by establishing an electrical power plant.

Mexico.

The Los Arcos Smelting & Milling Co., of Los Arcos, will start its new smelter this week. The smelter has a capacity of 150 tons per day.

Nuevo Leon.

H. C. Harrison, owner of the Benavidez mines and the smelter in the Cerralvo district, has placed an order for a 50-h. p. road locomotive and train of traction wagons, which he will use for hauling bullion from the smelter. The train will include, besides a powerful traction engine, or road locomotive, four ore cars of 12 tons capacity each. The road from the smelter to the railroad station is 22 miles.

Sonora.

The El Tigre mine case, concerning property in the Moctezuma district, has been appealed by the Ensenada Mining Co., composed of B. F. Graham and other original owners, to the State Supreme Court at Hermosillo. The decision of the case in favor of the Kansas City people, who control the El Tigre company, involves $30,000 in costs taxed against the Ensenada company. The El Tigre company has also brought suit against Graham and his associates for $500,000 damages. The El Tigre company is in possession of the property.

Trade Treatises.

Reliance Corliss engines are detailed in Bulletin No. 1,501 from the Allis-Chalmers Co. power department of Milwaukee, Wisconsin.

Bulletin No. 224 of the Sprague Electric Co., 527-531 West Thirty-fourth street, New York City, illustrates and describes the construction and use of their Type D direct-current motors.

Personal.

JAMES W. NEILL is at Butte.

ERNEST LEVY is in Hungary.

E. GYBBON SPILSBURY has sailed from New York for Paris.

MARTIN SCHWERIN is examining mines at Waldo, Oregon.

ARTHUR L. PEARSE sailed from New York for London on January 12.

F. A. KEITH, manager of the Tonopah Company, is visiting San Francisco.

G. C. HEWETT is examining mines in the Bullfrog and Death Valley districts.

W. R. CROSBY, manager of the Butters plant at Virginia City, is at the Palace Hotel.

GEORGE W. MAYNARD, of New York, is still in Mexico. He is now in western Sonora.

HENRY F. COLLINS has been appointed manager of the Cerro Muriano mines in Spain.

WILLIAM C. POTTER is 'Manager of Mines' for the American Smelters Securities Company.

A. P. MAYBERRY is in charge of the Eureka-Richmond consolidation, at Eureka, Nevada.

JAMES STERLING, formerly government geologist of Victoria, Australia, is now living at Los Angeles.

W. J. GRIGSBY has been appointed superintendent Phœnix mine and mill at Johannesburg, California.

F. E. TIFFT, of Denver, is building the new concentrator for the Arizona Copper Company at Morenci.

H. R. MCDONALD has been appointed superintendent of the St. Louis-Magnolia mine at Park City, Utah.

DEANE P. MITCHELL succeeds H. A. SHIPMAN as manager of the Oroya-Brownhill mine at Kalgoorlie.

THEODORE J. HOOVER, lately superintendent of the Standard mine, at Bodie, has gone to Parral, Mexico.

CHARLES C. JONES has removed his office from Salt Lake City to 247 Pacific Electric Building, Los Angeles.

H. E. VAIL has succeeded LEE GLOCKNER as superintendent of the Cosmopolitan mine, in Western Australia.

J. H. COLLIER, superintendent of the Hayden Hill gold mine, in Lassen county, is visiting San Francisco.

NEWTON B. KNOX, who arrived in San Francisco last week from Japan, is on his way to London, via New York.

C. OLSON, of Clarkston, Idaho, has been elected to succeed Frank Brown as manager Jumbo mine at Hump, Idaho.

A LOUGHRAN has been appointed superintendent Humboldt-Tonopah mine at Tonopah, Nev., succeeding W. F. Gunn.

M. CURNOW has succeeded JOHN SIMM as superintendent of the Dakota Mining Company at Portland, South Dakota.

FREDERICK S. HARRIS has been engaged as consulting engineer for the Goldfield-Crayton Mining Company at Goldfield, Nevada.

CORTLANDT E. PALMER is 'general superintendent of mining operations' for the American Smelters Securities (Guggenheim) Company.

M. CLARK is to have charge of the smelter of the Florence Smelting, Mining & Milling Co. at Price Station, Pinal county, Arizona.

HOMER D. FORD has left Denver to become assistant to the superintendent of La Leonesa Mining Syndicate, Matagalpa, Nicaragua.

B. A. WALLACE sailed from Vancouver on his way to Korea, where he has received an appointment with the British & Korean Corporation.

J. HEATH LEWIS has charge of the cyanide plant of the San Felipe mines of the Central Mining Co. near Hostotipaquillo, Jalisco, Mexico.

THE Pacific Coast executive committee of the American Smelters Securities Co. consists of E. B. BRADEN, W. R. RUST and H. B. UNDERHILL, JR.

J. M. BRYAN, of the Liberty mine at Masonic, near Bodie, California, is in San Francisco arranging for the shipment of a stamp-mill to his property.

T. C. ARCHER, who has been superintendent of the Oregon Securities Company's mine, near Bohemia, Oregon, has resigned, and has been succeeded by F. J. Eade.

WILLIAM H. HOWARD, superintendent Pueblo plant of the American Smelting & Refining Co., has resigned to take charge of the construction of the new copper smelter to be built near San Francisco. L. E. PALMER, superintendent of the Arkansas Valley plant at Leadville, succeeds Mr. Howard at Pueblo.

Obituary.

A. W. SALES, an American, assistant superintendent of the Sultana mine, in Sonora, was killed last week. He left the mine for Carba, 37 miles from the mine. The body was found partially devoured by coyotes, with the skull crushed. Renegade Indians are accused of the crime.

Latest Market Reports.

SAN FRANCISCO, January 18, 1906.

ANGLO-AMERICAN SHARES.

London, January 18, 1906.

	£ s d		£ s d
Camp Bird	1 12 9	Oroville	0 18 3
El Oro	1 8 9	Stratton's Independence	0 7 9
Esperanza	5 6 10½	Tomboy	1 6 10½
Dolores	2 1 3		

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. January 18, 1906.)

Amalgamated	$111¼	North Butte	$ 88
Anaconda	254	Old Dominion	39⅜
Bingham Copper	34½	Shannon	8¼
Daly West	17½	Tennessee Copper	48¾
Granby	9	Tonopah-Nevada	18¾
Greene Consolidated	29¼	United States	53
Nevada Con. Copper	11¾	Utah Copper	37

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 25	Ophir	$6 12½
Hale & Norcross	0 99	Potosi	0 06
Mexican	1 20	Savage	0 50
Exchequer	0 30	Yellow Jacket	0 15

[Tonopah and Goldfield.]

Belmont	$3 00	Montana-Tonopah	$1 85
Golden Anchor	1 57½	Ohio-Tonopah	0 36
Jim Butler	0 93	Red Top	2 15
Jumbo	1 30	Sandstorm	1 55
Kendall	0 88	Tonopah Ex	0 07⅜
Midway	1 85	West End	1 90

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: London, 30d (standard ounce, 925 fine); New York, (by wire), bar silver, 65½c, refined (1000 fine); San Francisco, 65½c; Mexican dollars, 51@53c, San Francisco; 50c, New York.

COPPER.—New York (by wire, average for week ending Jan. 18), Lake, 18⅝@18⅝c; Electrolytic, 18¼@18½c; Casting, 17⅞@18⅛c per pound. Mill copper plates, $21.00; bars, 21@24c. London: £78 5s 0d spot per ton.

LEAD.—New York (by wire, average for week ending Jan. 18), $5.60; San Francisco, $5.15, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½@8⅝c; sheet, 6¾@8⅝c; bar, 6⅝c. London: £17 ℔ long ton.

SPELTER.—New York (by wire, average for week ending Jan. 18), $6.65; London, £29 5s ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¼c.

TIN.—New York, pig, $36@36.50; bar tin, ℔ lb., 40c.; pig, 38c. London, £163 15s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $37.50@39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 33@37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR WEEK ENDING JANUARY 2, 1906.

808,803.—HORSE BLANKET—P. Andersen, Seattle, Wash.
808,967.—SPOON—W. H. Arrowsmith, Oakland, Cal.
808,808.—BROODER—C. J. Becker, Los Angeles, Cal.
808,806.—PRINTING PRESS—M. J. Barnett, San Francisco.
808,818.—TABLE AND BED—C. P. Davies, Oakland, Cal.
808,832.—TELEPHONE RECEIVER—T. E. Gallagher, San Francisco
808,916.—DRAPER—W. T. Gordon, Juniper, Or.
809,054.—ROTARY ENGINE—A. Hager, San Francisco.
808,752.—PIPE LINE—Isaacs & Speed, Oakland, Cal.
808,754.—TREATING ORES—W. J Jackson, San Francisco.
809,191.—TOOL—La Duke & O'Harra, Seattle, Wash.
808,774.—PIANO PLAYER—H. McPhaill, Visalia, Cal.
809,203.—ANIMAL TRAP—G. J. Miller, Endicott, Wash.
809,122.—SPIKE PULLER—L. A. Milligan, Barstow, Cal.
809,123.—STEAM GENERATOR—G. Mitchell, Los Angeles, Cal.
809,204.—STEAM GENERATOR—G. Mitchell, Los Angeles, Cal.
808,675.—TANK—A. B. Mouck, Twisp, Wash.
809,132.—TICKET HOLDER—N. A. Piancich, San Francisco.
808,868.—SIGNAL APPARATUS—K. H. Poyas, Los Angeles, Cal.
808,871.—TANK INDICATOR—Rahm & May, Sacramento, Cal.
808,880.—FOUNTAIN PEN—J. A. L. Snyder, Somis, Cal.
808,782.—PIPE LINE—J. B Speed, Berkeley, Cal.
808,806.—DRILL SHARPENER—J. T. Thompson, Tuolumne, Cal.
809,152.—PIPE WRENCH—G. W. Waitt, San Francisco.
809,038.—TRAP NEST—C. B. Williams, Ontario, Cal.
808,708.—CLAMP—W. B. Wingate, Spokane, Wash.
808,800.—DREDGER—F. V. Wright, San Francisco.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency the following are worthy of special mention:

DRILL SHARPENER, SHAPERS ANG GAGERS.—No. 808,886. Jan. 2, 1906. James T. Thompson, Tuolumne, Cal. This invention relates to machines for forming drill-bits of rock-drills. Its object is to provide a simple, cheap, practical machine for upsetting, sharpening, shaping and gaging drill-bits in one operation and to protect the heated portion of the drill from oxidation and consequent flaking and waste. Usually it requires several different operations and several different machines or tools to do these things, and where the drill is more or less exposed to the air during such operations, the drill tends not only to cool off rapidly, but to become oxidized on the surface and flake off. The apparatus comprises a suitably supported swage block, a correspondingly tapered sectional die fitting said recess, said die enclosing a space contracted at one end corresponding with the shape and size of a drill shank and spreading out at the other end corresponding with the head of the finished drill, a tapered dolly fitting said die, and a locking-bar to hold said dolly in the die.

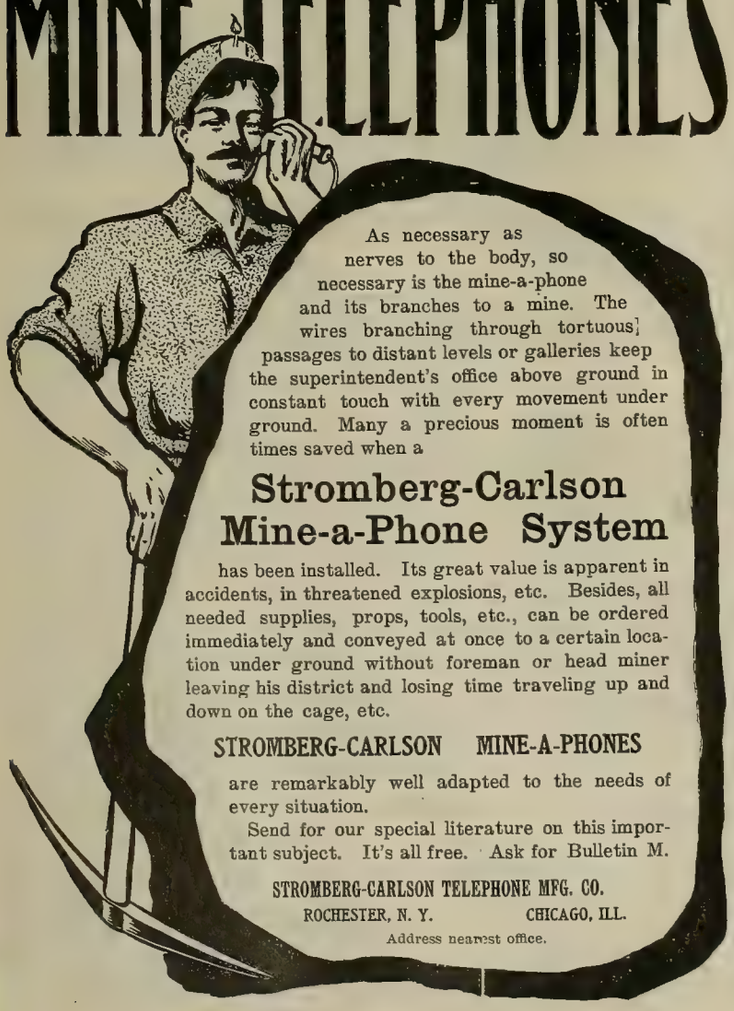
COMBINED TABLE AND FOLDING BED.—No. 808,818. Jan. 2, 1906. Charles P. Davies, Oakland, Cal. This invention relates to an interchangeable folding bed and table. Its object is to provide a simple and practical piece of furniture which will have ordinarily all the appearance of a table, but which, as occasion demands, can quickly and easily be opened out to form a substantial and comfortable bed. It consists of a central base-section having a bottom portion and vertical end portions, said end portions provided with foldable sections, box-sections hinged to said central section and co-operating therewith to form a bed or table, said box-sections arranged to have their ends pass inside of the end portions of the base when folded up into a table, said foldable sections of said base end forming stops to prevent said box-sections closing up when opened out into the form of a bed, a mattress carried by the sections, and said box-sections having hinged back portions co-operating with the bottom of the base section to enclose a containing box or chamber.

DISPENSING DEVICE.—No. 809,419. January 9, 1906. Gilbert L. Belcher, San Francisco. This invention relates to a dispensing can or holder to contain pastes, lubricants, and like viscous substances, and also liquids or semi-liquids, and pertains especially to a container whose contents are adapted to be discharged through the agency of a follower or plunger. Its object is to provide a simple, practical, inexpensive and convenient holder which will also serve as a handle, whereby the contents are kept sealed and thoroughly protected from the air, which holder will maintain its shape as against ordinary external pressure and which by a suitable contrivance will be made to eject its contents as desired. It comprises a tubular holder having a discharge-orifice therein, a cutting device movable in the direction of the length of the holder and a sleeve on the outside of the holder and carrying the cutting device, said cutting device engaging the follower to advance it to eject the contents of the holder.

DEVICE FOR REMOVING MINING AND OTHER DEBRIS.—No. 809,593. January 9, 1906. Simon W. Wible, Bakersfield, Cal. This invention relates to an apparatus which is designed to automatically remove mining and other debris or material which it is desired to remove. Its object is to provide an apparatus which can be automatically operated and by which the rock or other debris may be removed without suspending the washing operations. The device is also available to remove earth or any other material which it may be desired to so move. It consists of a rake composed of curved arms, adapted to engage the material, a central shank to which said arms converge and are secured, a caster-wheel upon which the shank is supported, a swivel attachment for a rope by which the rake and its load may be moved, spacing-blocks by which the outer ends of the arms are maintained in position, means carried by opposite sides of the rake for the attachment of ropes whereby transverse movement in positioning of the rake may be effected with relation to the material to be moved.

TEA STRAINER HOLDER.—No. 809,607. January 9, 1906. Abraham Chundelah, San Francisco. This invention relates to improvements in means for holding a strainer on the spout of a tea or coffee pot or on the edge of a dipper, ladle, or other vessel. Strainer holders as generally constructed are adapted to be thrust into the spout-opening and directly into the path of the discharging liquid, with the result that they are rapidly corroded and destroyed, beside choking up more or less the discharge-opening. The object of this invention is to provide a simple, cheap, practical detachable holder that is adapted to clasp the outside of a spout of any description and to be entirely out of range of the contaminating influence of the liquids to be strained and which device can also be attached to a dipper or ladle where it is desired to dip up soups and other liquids that may need straining. It consists of a holder of the character described comprising opposed jaws and opposed finger-holds and an intermediate hinge portion, and a rod projecting laterally from the jaw portion and having its outer end provided with means forming a swivel-support for a straining-basket.

MINE TELEPHONES



As necessary as nerves to the body, so necessary is the mine-a-phone and its branches to a mine. The wires branching through tortuous passages to distant levels or galleries keep the superintendent's office above ground in constant touch with every movement under ground. Many a precious moment is often times saved when a

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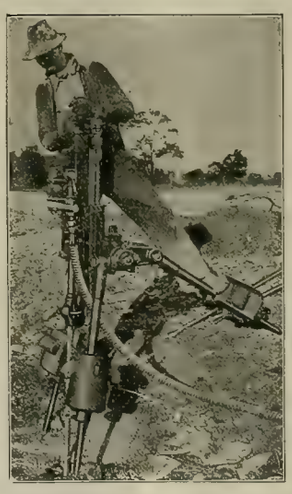

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SAN FRANCISCO, JANUARY 27, 1906.

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EDITORIAL.

ON the last page of this issue we publish metal quotations telegraphed to us from New York. Our readers will find them accurate. It will need time to demonstrate their reliability, but we look forward confidently to the period when buyers and sellers of ore containing these metals will use our quotations in making contracts.

CORNISHMEN at Grass Valley and Houghton, and everywhere else where any good mining is being done, will be glad to learn that old Dolcoath is not played out. A winze below the 470-fathom level has struck a body of ore which, for two or three months past, has yielded over 100 pounds of black tin per ton, and the shares of the company owning the mine have risen from five to twelve shillings. This will have a good effect on mining generally in Cornwall.

IN our last issue we reprinted part of an article taken from *Economic Geology*, a new magazine devoted to the scientific treatment of questions relating to ore deposits. This magazine has the support of a number of distinguished geologists, and we wish it success in the performance of the work for which it has been designed. We also expect to deal with the problems of ore formation as they appear to the miner and it will be of inestimable service to science and to industry if our contemporary will give voice to the finer ruminations of the scientific mind. We shall wear clothes stained with clay and candle grease, our friend at Lehigh University can don his academic gown, but, however appareled, we shall search for an answer to the same problems, the while we smoke the pipe that makes all men brothers.

IT appears that the Mexican authorities in Sonora have taken radical action in stopping further 'denouncement' (or 'location') of mining claims in that State and in Lower California; they have also held up all claims already in process of acquiring title. The explanation given is that this step was taken on account of the insults to Mexican officials and the complaints of foreigners that their rights were not protected. Whatever the merits of the quarrel, it is evident that those in authority have taken pains to prove that complaint is warranted, for this high-handed action is without precedent and is likely to create a most unfortunate impression among those who are investing money in Mexican mines.

THE fortuities of place are readily overcome nowadays by the help of fast steamships and limited trains. This annihilation—or at least contraction—of distance makes for better understanding among people living in widely separated regions. We can correspond with our mining friends in Australia with comfort, for a letter only takes three weeks; we can reach New York in less than four, and London in ten, days. Even the Californian engineers in South Africa need not feel exiled if they use the mail with sufficient frequency. These remarks are prompted by the receipt of a valuable contribution on dredging from a friend who writes to us from Switzerland during an interval of rest snatched from a nomadic occupation. The psychical distance that sometimes separates people belonging to the same household is less than the geographic leagues that friends can kill by kindly interest in each other.

A BILL is before Congress the purport of which is to apply a portion of the sales of public lands to the endowment of schools or departments of mines and mining in connection with the colleges established in the several States under the provisions of an Act of 1862, whereby public lands were donated to the several States and Territories that provided colleges for the benefit of agriculture and the mechanic arts. It is a supplement, intended to help mining education by means already applied to the aid of special instruction in other branches of industrial knowledge. The various schools of mines supported by State appropriations, and the special mining departments of State universities, are undoubtedly doing good work and deserve all the financial support that the community can afford to give them. While America has reason to be proud of the big technical institutions, her industrial development owes much to the smaller local colleges, which have given instruction to young men unable to go far from home or to take three or four years from a bread-winning occupation. There is only one danger in such subsidies to colleges, and that is an increase in their numbers, whereby the teaching talent is distributed among a large number of poorly paid positions. We need good teachers, properly paid, more than buildings, apparatus or multiplicity of institutions.

OUR first London letter appears in this issue. It will be found interesting. Among other matters reference is made to the Dolores Mining Company, the success of which is noteworthy because it was examined by four of the best men in the profession. We publish some extracts from the company's report, just issued.

Chinese Cheap Labor.

It is stated that Mr. Arthur Balfour, ex-Premier of Great Britain, cabled this week to Mr. Benjamin B. Lawrence of New York: "All is lost save golf." It is said on even better authority that Mr. Balfour remarked to Mr. Joseph Chamberlain, as Bill Nye did to Bret Harte, on the occasion of a celebrated poker game, when Ah Sin got the best of them: "We are ruined by Chinese cheap labor." Whether these words were actually used, we cannot swear, but we have excellent reason for believing that such sentiments as they express were felt during the last few days by gentlemen on the other side of the Atlantic. At the present moment the people of the Pacific Coast, whatever their opinion concerning the exclusion of the Mongol races, can afford to contemplate with intelligent interest the complications brought about by the introduction of Chinese into South Africa.

The overwhelming defeat of the Conservative party in the general election just ended in England, together with the great increase in the number of Labor representatives elected to Parliament, is certain to affect the situation in South Africa. The order in Council permitting the introduction of Chinese coolies to work in the mines of the Rand was the work of the Conservative administration recently resigned and now overwhelmingly discredited by the support given to their Liberal opponents. The employment of coolies under indenture was opposed from the first by a small party in the Transvaal, by the labor leaders in England and by a large number of people, some of whom were only sentimentalists, while others, it must be allowed, were much more than that. Unfortunately a problem which should have been discussed dispassionately and with full knowledge of economic conditions, became a political question. In consequence, it is likely that the action taken under Conservative government will now be reversed, for the new Liberal Premier is not likely to deny a demand for such action when made by the Labor leaders and endorsed by a large body of his more immediate followers. The introduction of Chinese has been unpopular; it was done in the best interests of the mining industry of the Transvaal, but as that industry is dominated by a group of clever German Jews, it has been easy to appeal to prejudice. Most of the mine operators are large-minded men of high character, but it has been difficult to make Englishmen see that their interests were national, and while mining men, acquainted with actual conditions in South Africa, have approved of the necessity for introducing a cheap and plentiful labor supply, the average Britisher has had an aversion to anything that savored of slavery. It is a sentiment, ill founded it may be, but people are often swayed by sentiment to the exclusion of logical thinking, and there is no doubt that the recent election in England was affected by this feeling just as much as it was by the debate between free trade and protection. To the British workingman the Chinese are simply blacklegs imported by capitalists to keep down wages and obviate the necessity for white labor at Johannesburg.

There are now about 50,000 Chinese on the Rand, and with them nearly 90,000 Kaffirs, the 140,000 colored workers being bossed by 16,500 white men. Recruiting for Chinese has been going on systematically for two years; it has been a slow process, because the average Chinaman hates to leave his easy work in the fields for the severe labor of the mines and to exchange the pleasant life of the village for a restricted existence in the compound. How they are recruited is told in the report of the American consul at Tientsin, which we reproduce on another page of this issue. The Chinese have proved a disappointment; while many of them are splendid fellows physically, most of them are inferior

to the Kaffir and not to be compared with the Zulu. The coolie is a wily fellow and shirks his work even more successfully than the native African; in consequence he requires more supervision, one white boss being set over eight Chinese. Some of the mine managers claim that the coolies are not needed, and that the higher priced white labor is in the end more economical; these critics have given facts and substance to the opposition which demands the repatriation of the Chinese. While this agitation was growing, some of the coolies managed to escape from the compounds, becoming marauders, wandering at will over the farming country of the Transvaal. Indeed, so many managed to get loose that extra police protection became necessary. This, of course, made the case worse and afforded another argument to the anti-Chinese party in England. Thus the matter stands. The probability is that the introduction of more Chinese will be stopped, even if the Liberal government refuses to be carried by the clamor of the Labor party to the extent of interfering more radically with present conditions in South Africa. Should the new Government go so far as to cause the repatriation of the Chinese, the mining industry will receive a vital blow and the political situation in the Transvaal will become acute.

However, the production of gold will not suffer as much as might be supposed. It has benefited less from the Chinese than was expected and, should their help be lost, more effort will be made to utilize white labor and whatever natives are available. The fact is, the history of South African mining during the past five years has been a series of disappointments. The close of the Boer war was expected to bring a betterment of economic conditions, a lessening of taxation and a cheapening of supplies. On the contrary, the war demoralized the native labor supply, it was succeeded by an expensive administration and by the imposition of heavy taxes. When matters looked bad, the mine operators urged that all that was needed was cheap labor, the white man could not work alongside the Kaffir and there were not enough Kaffirs in any case. Three years ago the Johannesburg papers began to shout that it was "Bankruptcy or the Chinese" for the Transvaal. The mines had 50,000 laborers and needed 150,000. The London market for South African shares was lifeless; everything looked gloomy; so the people acquiesced in the importation of Chinese. They came There are now 50,000 of them on the Rand. But this is not enough; 30,000 more are wanted. In the meantime the output of gold has increased to $9,000,000 per month and yet the quotations for shares have continued to fall until Rand Mines, a consolidation of interests in a group of leading companies, is £7, while it was over £14 on the day the Boer war ended. The Chinese have not benefited the investor at home as much as was expected, the labor problem is not solved and the whole matter has been plunged into the vortex of politics. It is a bad situation. But at the bottom of it all is a factor to which cheap labor is secondary. We refer to the high cost of living which has made the Transvaal anything but a white man's country. The 45,000 Chinese who first came to Africa received $1,500,000 in the first six months of 1905, while white men out of work stood loafing at the street corners. Excessive railway rates and heavy taxation have made residence prohibitive save to those receiving big salaries. A married workingman cannot live on less than $1200 per annum. Even American mining engineers in receipt of good salaries complain that they exile themselves for nothing; the ordinary expenses of maintaining a household, plus the numerous contributions to subscriptions and funds of every kind, make such inroads into their receipts that there is but little left. A Californian engineer who has lived at Johannesburg for three years told us that except for half a dozen men who were at the top, the rest of the profession were no better off than at home, despite the apparently larger salaries they received. The high cost of living is the curse of the country, and improvement in this regard forms the only lasting solution of the problem that threatens to bankrupt South Africa. It is not a pretty picture, that of a big gold mining region undergoing exploitation with the assurance of exhaustion without particular benefit to anyone

Profits are not increasing in the ratio expected, for costs are scarcely down to a pre-war basis despite better government and Chinese labor. The position can be expressed by example. In 1899, before the Boer war, the Simmer & Jack mine during six months crushed monthly an average of 44,213 tons of 8 dwt. ore and realized therefrom a profit of £31,218. In the best month since the war the same mine produced 52,800 tons of 7½ dwt. ore at a profit of £31,596. The increased tonnage did not yield a larger profit on the slightly poorer ore, despite the investment of additional capital and the introduction of alien labor. This typifies the position on the Rand. Shareholders have seen their holdings depreciate steadily, while the life of the individual mine is measurably nearer an end; there has been no such immigration of white settlers as was expected; a mining camp has been supported and gold has been dug in increasing quantity without any marked benefit to those on the spot or to those at home, except the officials and a few speculators. The economic problem has not been solved while a nasty political squabble is impending as soon as the Transvaal gets self-government, an event to occur shortly. As we see the situation at this distance, without special knowledge and also without prejudice, it seems to us that the well-being of South Africa depends upon such adjustment of economic conditions as is within the scope of government, by lessening the expenses of administration, by regulation of railroad freights and by diminution of the indirect taxation levied through custom duties. Any condition that makes it impossible for a man to maintain a home is bound to place a bar to the permanent prosperity of a country.

The Price of Copper.

Mining of late has been much stimulated by the rise in the useful metals, more particularly copper. During 1905 the price rose from 14½ to 19 cents, the average being 15¾ cents per pound. Apart from its effect on copper mining proper, in which the precious metals are extracted as a by-product, this rise has encouraged prospecting and opening up of low-grade mines throughout the West, for the growth of metallurgical plants intended to treat the copper output has improved the market for silicious ore unsuited to stamp-milling or cyanidation.

Extraordinary conditions have existed in the copper market during the past year; the large purchases for Chinese account took away all surplus stock in America and when, late in summer, a large consumption demand set in, increasing in volume during December, it became apparent that there was an unprecedented shortage of spot metal. Prices advanced by leaps and bounds. Manufacturers who had not covered, and who had to enter the market to buy small lots in order to keep their mills going, were forced to pay almost any price asked. During the last week of 1905 and the first week of 1906 small lots for immediate delivery sold as high as 19½ and 20 cents, while a large business took place, at first hand, for later delivery, up to May, at 18½ cents delivered, payment in thirty days. Hence the apparently contradictory figures given out by different agencies. It is a most difficult matter to arrive at an accurate average. One must consider not only every known transaction, but also the offering and bids in the market for any but retail quantities. Due weight must be given, in the first place, to sales that are made at a certain figure; then to bona fide offers made but not accepted; and finally to bids, made by would-be purchasers, that do not lead to actual business. At times, when the market is firm, a great many buyers may come out without proportionate selling and, on the other hand, there are days when holders are anxious and ask certain nominal prices which they would gladly shade the moment business is in sight; this condition also should be expressed in the quotation of a true average.

The big rise in the price of the metal led last week to re-sales, by the Chinese, in Europe and the United States of parcels large enough to depress the price. As a consequence, the market has eased up. In any event, a decline from the maximum was to be expected and most well informed observers have wondered at the capacity of the demand which has maintained such prices so long. It has become evident that consumption is on a prodigious scale and if the present industrial conditions continue, all the copper likely to be produced in 1906 will be wanted at good prices.

By the Way.

In his presidential address, before the New York Academy of Sciences, Professor James F. Kemp said:

The rush of the gold-seekers to California in 1849, and the quickly following one to Australia in 1851, were notable migrations in search of the yellow metal, but they were not the first in the history of our race. There is, indeed, no reason to suppose, that, in the past, mining excitements were limited even to the historical period; on the contrary, the legends of the Golden Fleece, and of the golden apples of the Hesperides, probably describe in poetic garb two of the early expeditions; and long before either we can well imagine primitive man hurrying to new diggings in order to enlarge his scanty stock of metals. Among the influences which have led to the exploration and settlement of new lands, the desire to find and acquire gold and silver has been one of the most important; and as a means of introducing thousands of vigorous settlers, of their own volition, into uninhabited or uncivilized regions, there is no agent which compares with it. In this connection it may be also remarked that there is no more interesting chapter in the history of civilization than that which concerns itself with the use of the metals and with the development of methods for their extraction from their ores. Primitive man was naturally limited to those which he found in the native state. They are but few, viz., gold in wide but sparse distribution in gravels; copper in occasional masses along the outcrops of veins, in which far the greater part of the metal is combined with oxygen or sulphur, copper again, in porous rocks, as in the altogether exceptional case of the Lake Superior mines; iron in an occasional meteorite, which, if its fall had been observed, was considered to be the image of a god, descended from the skies; silver in occasional nuggets with the more common ones of gold; and possibly a rare bit of platinum. Besides these no other metal can have been known, because all the rest and all of those mentioned, when locked up in their ores, give in the physical properties of the latter but the slightest suggestion of their presence. Chance discoveries must have first revealed the possibilities of producing iron from its ore—really a very simple process when small quantities are involved; of making bronze from the ores of copper and tin; of making brass with the ores of copper and zinc; of reducing copper and lead from their natural compounds; and of freeing silver from its chief associate, lead. All of these processes were extensively practiced under the Chinese, Phenicians, Greeks, Romans and other ancient peoples.

As the need of weapons in war, the advantages of metallic currency and the want of household utensils became felt, and as the minerals which yield the metals became recognized as such, the art of mining grew to be something more than the digging and washing of gravels; and in the long course of time developed into its present stage as one of the most difficult branches of engineering. Chemistry raised metallurgical processes from the art of obtaining *some of a metal* from its ore, to the art of obtaining *almost all* of it and of accounting for what escaped. It is, in fact, in this scientific accounting for everything, that modern processes chiefly differ from those of the ancients.

Of all the metals the most important which minister to the needs of daily life are the following, ranged as nearly as possible in the order of their usefulness: Iron, copper, lead, zinc, silver, gold, tin, aluminum, platinum, manganese, chromium, quicksilver, antimony, arsenic and cobalt. The others are of very minor importance, although often indispensable for certain restricted uses.

The manner of occurrence of these metals in the earth, and their amounts in ores which admit of practicable working, are fundamental facts in all our industrial development, and some accurate knowledge of them ought to be a part of the intellectual equipment of every well-educated man. The matter may well appeal to Americans, since the United States have developed within a few years into the foremost producers of iron, copper, lead, coal, and, until recent years, of gold and silver; but with regard to gold, they have of late alternated in the leadership with the Transvaal and Australia, and in silver are now second to Mexico.

Despite the enormous product of foodstuffs, American mining developments are of the same order of magnitude; and the mineral resources of the country have proved to be one of the richest possessions of its people.

AMALGAMATED PLATES made of Muntz metal do not absorb mercury as much as copper plates. On the other hand, the mercury does dissolve a good deal of the copper and zinc constituting the Muntz metal. Silver plating is almost a necessity, as it prevents the mercury from dissolving copper from the plate and therefore does away with the chief cause of the stains that are prejudicial to good service. Muntz metal plates have been used for many years in the Thames or Hauraki district of New Zealand, and they are especially adapted to pyritic ores and to mills using mine water.

CONCENTRATES.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

THE present winter in northern Alaska is reported to be the most severe in several years.

BORAX is the most commonly used flux employed in melting gold obtained in chlorination plants.

PLATINUM is found in a great many places in California, but these occurrences are usually of limited value.

THE highest price ever reached by quicksilver on the Pacific coast was $1.55 per pound—$118.575 per flask of 76½ lb. net.

WHERE placer claims conform to the Government land surveys, no survey of the claim is required when application is made for patent.

ANTIMONY can often be eliminated from gold and silver ores by roasting, as the metal and its sulphide volatilize at comparatively low heat.

A HORSESHOE magnet will become de-magnetized if heated to redness. A moderate degree of heat, however, will not affect a magnet of this kind.

NATIVE platinum in ore has recently been reported from a number of places, but in all probability there has been some mistake in the identity of the mineral.

AN ore-shoot is a mass of ore in a vein, fissure, or deposit. Chute is a passage-way for ore, underground or on the surface, and is built of timbers and plank.

FLY-WHEELS can easily be speeded up to their destruction. A safe peripheral speed is not above 5,000 ft. per minute, except with specially constructed wheels.

THE chief advantage of suspended ore-feeders in stamp-mills is that they afford more room and light back of the battery—things much to be desired in some mills.

SEVERAL other metals and alloys are substituted for copper when the price of copper becomes prohibitive. The chief substitutes are aluminum and babbitt metal.

GOLD which is 750 fine is worth $15.50 per ounce; 800 fine, $16.53; 850 fine, $17.57; 875, $18.08; 900, $18.603; 920, $19.01; 930, $19.22; 950, $19.63; fine gold—1,000 fine, $20.6718.

MUNDIC is a name given by Cornish miners to several varieties of iron sulphide—pyrite, marcasite, mispickel, etc. It occurs bearing gold and also practically destitute of it.

THE cost of timber per foot in a shaft must depend upon the size of the shaft, dimensions and cost of timber and wages of men. Ordinarily it is from $2 to $2.50 per foot of shaft.

THE electric plant for the Utica Mining Company, at Angels, Cal., was installed in 1899. The power house is on Angels creek, near Murphys, and about eight miles from the mine.

UNDER certain conditions aid is given prospectors by the Government in Australian mining districts and substantial inducements are offered for prospecting and discovery of new districts.

STEAM boilers explode from a variety of causes, but chiefly owing to weakness of the plates, or some defect in the safety valve. Very often the immediate cause cannot be satisfactorily determined after the explosion.

THE gold output for California for the year 1905 was considerably less than it would have been had the water supply been sufficient to have continued mining and milling operations without interruption throughout the year.

THERE may be considerable difference to the ore shipper whether he receive 90% of the assay ounces at $20.67 per ounce of his gold, or 92% of the assay at $20 per ounce for the gold. It is not a difficult matter to figure.

CONCENTRATING JIGS are made of many types and of all sizes, from small machines designed for laboratory tests, and run by hand, to large machines of several hundred tons daily capacity, feeding and discharging automatically.

WHEN sinking a shaft, either vertical or inclined, it is advisable, and in the end generally more economical, to put in station timbers at every point where it may subsequently be desirable to open a level. It is not necessary that the station be cut at the time of sinking, though always less expensive to do so at that time, together with the pocket beneath the level, from which skips may be loaded.

CONSIDERABLE gold is produced by mines in Japan, but all mines in that country are controlled by the Government, and mineral lands are not subject to appropriation as in English-speaking countries, and in most others.

MOST of the stamp-mills in Gilpin county, Colo., are still of the high, slow-drop type. It is thought by local mill men that this kind of mill gives better results than the rapid low-drop mill of California type, on Gilpin county ore.

A GOOD paste to clean steel which has become rusty is made from 10 parts of tin putty, 8 parts of prepared buckhorn and 25 parts spirits of wine. Mix to a paste and rub vigorously on the part to be cleaned, and polish with blotting paper.

GOOD roads in the mining regions of the mountains will do much to reduce transportation costs. Ordinarily it is figured that it costs 25c. per ton per mile to haul machinery and other mining supplies in the mountains of the West.

ONE of the secrets of success in mining is in knowing when to quit. Some mines which have made large profits for their owners have later bankrupted them because they continued to expend large sums of money on them after the orebodies were exhausted.

THERE is now far less mine 'jumping' than in former years. Prospectors and miners have become better informed as to the legal requirements and comply more nearly to them than formerly. A careful observance of the law is the best safeguard of the miner's title.

IT is not always the most scientific mining that is the most profitable. Some mines are worked in anything but what an engineer would consider scientifically, but which will justify no greater outlay nor a more elaborate method of operation, and are still profitable to the owner.

WHILE smelting is a metallurgical process which will successfully treat every ore, if suitable fluxes are available, these fluxes are not always obtainable at a cost which will admit of profitable smelting at the place where the ore occurs. For this reason much ore is shipped to distant reduction works for treatment.

IT is always good business to develop sufficient ore to pay for a mill before building it, and it is still better to open up enough ore to insure a continuous supply for a considerable period. Too often the mill is built before the mine has enough ore exposed to pay the freight on the mill.

IT is 24 years since copper was as high as at the present time. Nineteen-cent copper affords large profits to most operating copper mines and permits some to run which at a little lower price could not pay expenses. The cost of producing copper under favorable conditions has never been so low as now.

SOME California mines produce remarkably fine gold. The San Giuseppe mine, at Sonora, Tuolumne county, which has been idle for some years, produced gold 985 fine—an unusual thing in a quartz mine. The gold produced by the Mount Morgan mine, Queensland, Australia, has averaged about 980 fine.

THE hydraulic ejecting device or elevator (generally referred to as a pump) was installed in the C. & C. shaft at Virginia City, Nev., in the spring of 1899. It quickly and effectually drained the mines in its vicinity, several hundred feet below the Sutro Tunnel level, 1,750 ft. below the surface. The water level is now about 2,350 feet.

THERE is little to be gained in running a tunnel only a few feet beneath the surface, as such excavations only serve to determine the direction of strike, and they usually cave in within two years unless the ground and climate be very dry. Such tunnels, in wet regions, to be kept open must be substantially timbered and often repaired.

IT is not necessary that a vein should outcrop the entire length of the claim to secure the extra-lateral right. It is only necessary that sufficient of the vein be exposed to determine its strike. This is sometimes deceptive, and the claim is laid out in such a manner that subsequent development shows the vein to cross a side line and one end line.

COLLECTIONS of ores, minerals and metals at the county seat of each county of the mining States, which would faithfully represent its mineral resources, could not fail to be of advantage to the section making such local exhibition, as strangers would usually visit and inspect the display, and in this way the probabilities of the development of local interests would be increased.

THE first discovery of gold in the State of Colorado is said to have been made at Idaho Springs on Jan. 21, 1859. The gold discovery which resulted in the stampede of adventurers into the Black Hills of South Dakota was made in 1875 by a half-breed Indian in the foothills of the Black Hills, many miles from any known mines of the present day. No development work has ever been done in the vicinity of the Indian's discovery, and but few men know today that the find was not made within the hills in the region where gold-bearing veins are known to exist.

UNDER exceptionally favorable conditions a gold mine may be operated at a total cost of 50c. per ton, but the conditions must be favorable, indeed. These comprise a large vein of easily broken ore, a means of outlet below, as by an adit driven to connect with mill-holes, through which the ore passes from open-cuts to ore-bins beneath. Transportation must be cheap, the ore free milling, and the mill of large capacity. Failing any one of these, the expense of operation is likely to at once go above 50c. per ton. In addition to the above, and as important as any other consideration, there must be good management.

THE blowing of a charge of matte in a copper converter can only be accomplished satisfactorily by an experienced operator. When the blowing begins, and for some time thereafter, greenish flames are seen playing over the surface of the charge. These are often mingled with yellow flames in the first stages. When the blowing has proceeded until skimming time approaches, blue flames will be observed, occasionally, and if blowing is not stopped, the flames will become altogether of azure blue. When the blue flames have become prominent the blast must be shut off, or the contents of the converter, or a good portion of them, may be blown out and the molten metal scattered all over the place. This foaming and explosive action is caused by chemical reactions taking place in the charge, and the sudden formation of a large volume of sulphurous anhydride (SO_2).

THE cost of stoping a ton of ore depends upon the size of the orebody, its hardness, and its 'let go' (gouges or not), angle of inclination of the vein or deposit, cost of wages and supplies. The stoping of a vein less than one foot wide may be several dollars per ton—$50 or more—and the stoping of a large mass of ore may be reduced to a few cents per ton. No table showing the approximate cost of stoping or mining generally can be compiled, which would be satisfactory or reliable, except possibly for a particular mine where the conditions were well understood and established, and the only differential factor is the changing width of the vein. In some veins a portion of the ore is separated from the walls by a selvage or gouge, and breaks freely from the walls, while in another portion of the same mine, the ore is 'frozen' to one or both walls, which increases the expense of mining.

THE method of separating gold from copper matte by the Block-Hartman process is by roasting the matte to convert any silver present to sulphate, which is then leached out with water and precipitated as metallic silver or copper, the gold remaining in the matte, which is then concentrated in a reverberatory furnace until a small quantity of copper is obtained carrying nearly all the gold. The further treatment, whereby the gold is separated from the copper, is by various means. At Argo, Colo., this process has been reduced to a science, but the method employed has never come to the knowledge of the public, although it has been in use there many years. By roasting gold-bearing copper with pyrite, or sulphur, a matte of copper and sulphur will form on top of the charge, the gold remaining in association with the metallic copper, which is not attacked by the sulphur. In this way the greater portion of the copper may be removed, the metallic portion constantly becoming richer in gold as the amount of metallic copper is lessened, the percentage of gold finally becoming sufficiently high to admit of its being cupelled with lead, producing gold which can be dissolved and precipitated as fine gold.

THERE is a great difference in mill screens and a still wider difference in the opinions of millmen as to their relative merit. Wire-cloth screens present a greater aggregate discharge aperture than perforated or slotted metal screens of equal width of opening. Attempts have been repeatedly made to manufacture a punched or slotted mill-screen having a discharge area equal to a wire-mesh of the same width apertures, but when this is done with ordinary mill-screen sheets the metal is so weakened by the process that it quickly breaks, making the screens expensive. If the metal selected is of a strength sufficient to long resist the impact of the flying rock-particles in the battery, the metal is so thick as to seriously impede the discharge of the pulp, hence the resort to wire-screens where fine crushing and large capacity are desired. It is not infrequently a good idea to decrease the size of the mesh of a mill-screen, of whatever kind, and lower the height of discharge. This results in a finer comminution of particles, while facilitating discharge, but it also subjects the inner surface of the screen to greater wear from impact of flying rock. In some mills the battery screen is divided into three or four sections, the screens being slipped into frames, and being square may be reversed, thus equalizing the wear, but this seems like doubtful economy, as the three ribs placed transversely of the screen opening will reduce the discharge area about 10%, and this more than offsets the additional cost of screens, owing to increased wear. The screen surface should be as large as practicable and be kept free from obstructions of every kind. Nothing is more destructive to screens than overfeeding.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

GOLD DREDGING.

The Editor:

Sir—I have had occasion recently to enquire into various aspects of gold dredging. I find that whereas the purely technical side of this industry, such as dredge designing and operating, has been written about a good deal, the statistical and financial aspects have hardly been dealt with at all.

Let me enumerate some questions to which as yet I have not found satisfactory answers:

1. How many payable, or probably payable, dredging areas are known in the world, and what is, approximately, their gross extent? Which are the likeliest countries to prospect?
2. How much gold is produced yearly by dredges, and how much of the production is profit?
3. How many dredges are now working at a profit?
4. How many dredges that were once worked are not now working, and what were the reasons for their stoppage? How much money do these represent?
5. What are the precise costs in different localities? How are costs affected by
   a. Type of dredge?
   b. Nature of deposit?
   c. Nature of power?
   d. Climate?
6. What is the best system of prospecting dredging ground? How should such system be adapted to different kinds of ground? Is drilling as effective as sinking shafts or paddocks? What is an average recovery of the gold contents as shown in prospecting? Why are favorable results in prospecting often falsified in practice?
7. Assuming prospected or otherwise proved ground to represent 'ore blocked out', which is the correct basis of valuation for such ground?

If gold dredging is to be regarded as a scientific industry, it seems to me that satisfactory answers to such questions as these should be procurable. A mass of facts must be available by now. Can you not, through your many sources of information, undertake the collection of these?

The cardinal fact which would seem to emerge from my enquiries is that the known areas of profitable dredging ground are not numerous, and are limited to a few countries. When recently in San Francisco I had this statement endorsed by the man who, I consider, knows more about gold dredging than anyone else. He has for years past sent experienced prospectors over the United States, South America, the East, and elsewhere, but, I understand, outside of his Californian properties has found nothing definitely good. Of course, one must not jump to the conclusion that no more good areas will be found. South America, Alaska, Siberia, India and the Eastern islands still offer an immense field for research; and, although ideal dredging conditions cannot exist in these countries, there is no reason why they should not contain many payable areas. In the meantime, it may be taken for granted that the definitely good areas are limited. Ideal dredging conditions exist, I believe, only in certain parts of California and New Zealand, while Victoria ranks next, but a long way behind. At present the two first named countries are probably producing 75 per cent of the gold won by this method. Dredging in the United States is, I understand, almost confined to California. I make the statement, subject to correction, that there are not more than four dredges working elsewhere at a profit, and that outside California conditions for working are usually unsatisfactory. Several dredges are said to be working at a profit in Montana, but I have found no one who can give me exact statements. In California the chief center of dredging is Oroville, where the conditions are quite ideal. A recent visit to this field impressed me with the idea that the Oroville gravels —proved as they are—form the safest gold mining venture in the world. At Folsom there are also good dredging areas, and Bear River should soon become profitable. But the center of interest in gold dredging will soon shift to the Yuba river. Here a large area of gravel 90 ft. deep has been found to give good values, and several dredges already at work have confirmed these results. One company, alone, will shortly be working 15 dredges, of a new and very powerful type. The strength and efficiency of these is such that they will handle 90 ft. of gravel as easily as the other types can handle 30 feet.

In Canada, dredging on the Fraser and Saskatchewan rivers has been, somewhat unaccountably, a failure; I should like to know the reasons for this. I should also like to have precise figures about the dredges working at Atlin, British Columbia. It is stated, vaguely, that they are working profitably, but, knowing Atlin as I do, I am sceptical. This same frame of mind clutches me when estimating the chances of dredging in all the northern regions—Klondike, Alaska, Siberia. The climatic factor in these countries seems to me almost to exclude the hope of profitable results. The short season, the perennially frozen condition of much of the ground, the heavy cost of labor, and the great distance from foundries and sources of supply, are surely drawbacks of almost vital importance. I am told that dredges are now working profitably both in Klondike and Alaska, while the Russian minister of mines assured me that a number of dredges were getting payable results in Siberia. But I am still sceptical. I have never seen figures or results from any of these places. I shall want to see the balance sheets for, say, two consecutive years' work by some of these dredges, before I can believe that in these countries the climatic factor is not overpowering.

South America, with its immense river systems, offers a great field for possible dredging areas. As yet, results there are of doubtful value. Colombia has been a good deal prospected, with, I believe, not satisfactory results. In Dutch and French Guiana some dredges are working, but I do not know with what success. I lately read a report on ground in Peru, stated to go 75 cents per yard. The writer was a man of presumable experience; had he not been, I should have looked on such a statement as a fairy tale. This ground lies on the eastern side of the Andes, and a dredge would have to be transported in sections. Moreover, as for a long distance there is a precipitous descent, and that by bridle-track only, the sections must be no heavier than a couple of mules could carry between them. It seems to me that a dredge thus designed, especially if working in heavy ground, would surely be a failure. I should like information on this point—not only as to whether it can be sectionalized down to, say, eight cut pieces —but as to whether it can be expected to do satisfactory work on that basis. Buenas Ayres has recently been the scene of a dredging boom—on paper. The locality of the area thus boomed was the river San Juan de Oro, in Bolivia. The first dredge started there worked for six weeks without getting as much as one ounce of gold. It then transpired that the men in charge—picked experts of reputation from New Zealand—had been badly 'salted.' I am afraid there is not much chance for success in this locality.

One of the first dredges worked in South America was located in Matto Grosso, the interior province of Brazil. This dredge has demonstrated the existence of gold there; and the reports of prospectors, if they can be relied upon, point to a large area of possibly payable ground. It is notable that the Matto Grosso gravels carry also diamonds, which are caught on the dredge in considerable numbers. Brains are now at work devising a supplementary plant, which will recover the diamonds after the gravel has been dredged for its gold. Elsewhere in Brazil there is a good deal of prospecting being done, but in a manner I would describe as superficial. I saw lately a dredge at work in the river near the old mining town of St. John del Rey. This belonged to a New Zealand company, and, I believe, was paying expenses. In Tierra del Fuego there are large areas of gravel carrying gold. Those on the Argentine side were extensively prospected by two friends of mine last season. The conditions were pronounced as favorable, but there was too little gold present. On the Chilean side there are some undoubtedly rich areas; but here the ground is rougher, and would require a specially adapted type of dredge. These areas may, I think, be reckoned as possibilities.

New Zealand, Victoria and New South Wales, alone among Australasian States, seem to contain payable gold-dredging areas—though in Tasmania dredging for tin is now being done. Even about dredging results in New Zealand—the home of the industry—there are surprisingly few facts available. I believe that one-third or even one-half of the dredges started in New Zealand have worked at a loss; this would seem to indicate that the methods of prospecting there are casual, and that there are no systematized results to guide would-be valuers of ground. I am told that all possible dredging areas in New Zealand have long ago been secured, also that at the present rate of exhaustion most of the best ground will be worked out well inside 12 or 15 years.

After numerous failures, specially adapted dredges, or, in cases, hydraulic pumps, are now securing fair aggregate results in Victoria and New South Wales. Most of the areas worked, however, are of small extent, and profits are on quite a small scale. As elsewhere, it seems likely that the areas in Australia where dredging conditions are favorable will prove to be limited.

In Rhodesia, or rather over the Rhodesian border, in Mozambique, there was an abortive effort at dredging, the conditions proving unsuitable. I believe this is the only dredge erected in South Africa. In West Africa there is certainly gold in the rivers, but I am sceptical as to general conditions. There are some half dozen dredges now at work there, but their results are indifferent; moreover, I imagine that the richest patches are being worked first.

As regards the East, there is not much yet known of its dredging areas. In Burmah, on the Irrawaddy, a prospecting dredge has been at work for some time. I understand that it has shown profitable figures, but I have no facts about this. However, I look on Burmah as among the possibilities. It seems to me, also, that India is a country to be prospected, but I know of nothing as having yet been done there. Two dredges are at work in the Malay State of Kelantau; from the published returns I judge that they are not paying. In Korea, the Oriental Company is to try an experiment in dredging; while it is stated that in Borneo and the Celebes there are hopeful prospects.

In Europe, there are several dredges at work in Servia. I believe these have earned a commercial profit, for others are being built; but, as usual, there are no precise figures available. In Hungary, there might be dredging areas, but I suppose there is little to be expected of the rest of Europe.

As I started out to ask for information, not to give it, I think I have said all that is compatible with my premises, and I shall not venture into the details of a discussion on which so many others must be better informed. I can, however, say first this, that I believe the Oroville 'school' of dredging, both in methods of prospecting and in designing, is now quite ahead of New Zealand, and that the work now being done at Oroville and Yuba river should be studied by all who wish to master the details of this subject. The exact results from the Oroville field to date, together with a description of the prospecting methods employed there, and an account of the evolution in the type of dredge now in use there, written by those who know, would form a valuable nucleus of facts on which to base a general enquiry into the whole subject.

J. H. CURLE.

St. Moritz, Switzerland, Dec. 24, 1906.

FINE GRINDING.

The Editor:

Sir—I have read with interest the communication on 'Fine Grinding in Metallurgy,' by Mr. E. E. Wann, dated November 29, in your issue of December 16.

Mr. Wann says, in part: "Fine grinding having proven a pre-requisite for the highest extraction by amalgamation and cyanide leaching of gold ores." By fine grinding, I take it that Mr. Wann means crushing the material to such an extent that the largest particle will be fine enough to pass a 150-mesh screen. My experience, gained in this country, the Australian colonies and Mexico, leads me to believe that in the great majority of cases such fine grinding is by no means essential to securing the best commercial results. Of the number of varying classes of ore I have had occasion to examine during my six or seven years' residence in the West, I have met but two or three instances where fine grinding gave an increased commercial extraction of the gold and silver content. In most cases, where the larger portions of the crushed ore were fine enough to pass a 50-mesh screen, or, in other words, were approximately one one-hundredth inch diameter, a greater profit was obtained than when the material was pulverized to slime.

It may be generally stated that, wherever careful classification is carried out, and absolutely free sharp sand is dealt with by percolation, results equally as commercially good will be obtained from the sand as from the slime, though, of course, the treatment of the sand will require probably four to ten times as long as the slime.

In the somewhat rare cases in America in which fine grinding will show greater profit than average crushing, sand and slime treatment, I am strongly in favor of the grinding pan as a comminutor. The pans in pairs are about equal to one 14-ft. tube-mill in capacity, are slightly cheaper in operating and maintenance expense, and are about one-half the cost erected. If used in two series—stage grinding, with intermediate classification—it is probable that their capacity would be still further increased.

For slime treatment, either for true slime or finely pulverized ore, agitation in large, deep, flat-bottomed vats, fitted with revolving arms, to keep the solids from settling out of the thin pulp generally necessary, and with large centrifugal pumps, drawing from the bottom and throwing to the top for agitation and aeration proper, is universally the most economical system.

Removal of the dissolved value can be most economically and perfectly performed by the use of vacuum filters of the Moore-Butters-Cassel type. These filters are rapidly coming into use. They are about one-half the cost, by tonnage treated, of the standard-type filter-press, and their operation is attended with about one-third the cost. In but very few cases can an adequate extraction be obtained from the slime by conducting the treatment in filter-presses; it is almost universally imperative to dissolve the metals by agitation prior to the separation of the gold-bearing liquors from the solids.

In the treatment of gold and silver ore, considerable time is saved and a slightly increased extraction obtained if crushing in the solvent be resorted to. For the treatment of clean sand by percolation, more particularly silver-bearing material, two, and even in some cases five, treatments have been found profitable. The handling of this material can be economically performed by the use of the Blaisdell excavating, distributing and conveying apparatus. In a skillfully designed plant, sand may be moved from one vat to another, using the above machinery, for approximately one cent per ton, and the extraction and profits enormously increased.

As an instance of the fallacy of attempting to fit the methods of one country to the ores of another,

may be mentioned the case of Western Australian ores and those of Cripple Creek, Colorado. In the former case, fine grinding is distinctly necessary to fit the raw ore for the highest commercial extraction, while at Cripple Creek an almost equally good extraction may be obtained at 30-mesh as at 200-mesh, either by bromo-cyanide treatment of raw ore, or by simple cyanidation of the roasted ore. As a matter of fact, a considerably higher extraction may be obtained on the roasted ore at 30-mesh than upon the raw ore, using bromo-cyanide at 200-mesh, and finer. The ore in both the above-mentioned districts has points in common, that is, that much of the gold in the material from the lower levels of the mines is combined with tellurium.

GODFREY DOVETON.

Denver, Colo., January 8, 1906.

THE DETERMINATION OF COPPER.

The Editor:

Sir—In the November, 1905, issue of the *Chemical Engineer* there appeared an article on 'The Determination of Copper' by Thorn Smith, Research Chemist, Ducktown Sulphur, Copper & Iron Co., Isabella, Tennessee. In the MINING AND SCIENTIFIC PRESS of November 11, 1905, there appeared a short article on a method for the 'Determination of Copper in Slags,' which I have successfully used for the past four years

A careful comparison of these articles shows the methods to be almost identical, and thus Mr. Smith's statement that "for simplicity, speed or accuracy no method has ever been published that approaches the above" is incorrect. To prove that this so-called "Thorn Smith method" has been in use by me I can refer those interested to Mr. Charles F. Shelby, Smelter Superintendent Old Dominion Copper Mining & Smelting Co. at Globe, Arizona, and Mr. Randolph Van Liew, his predecessor. The method is an excellent one, and has at all times given satisfaction. The intention of this letter is merely to call attention to the fact that this method is no new one and that Western copper chemists are not necessarily so slow as some would make them.

HENRY A. TOBELMANN.

Roosevelt, Arizona, January 18, 1906.

MINING ENGINEERS AND GEOLOGISTS.

The Editor:

Sir—In Mr. Forbes Rickard's contribution on this subject, I believe he expresses the sentiments of the majority of engineers throughout the country; I know he thoroughly expresses mine. I shall go a step further and give the feeling that I believe exists in many cases between the mining engineer and the mining superintendent and his lieutenants (foreman and bosses).

We of the engineering profession are very apt to underrate the intelligence and ability of the average superintendent; we go to a mine in the capacity of examining engineer or consulting engineer and meet him, but our dealings and conversation are confined mainly to the manager, consequently our acquaintance with the superintendent is slight.

I have the utmost respect for the superintendent, and with him are included the foreman and bosses; in many cases they are what the engineer is not—but should be—cool, level-headed men of horse-sense, with a thorough knowledge of mining. They know what a shift's work is and when it is being properly done, they know when a set of timbers is put in correctly, and a thousand and one other things essential to good mining. They are men who have, as a rule, started as 'muckers' or 'trammers,' and by hard steady work, have pulled themselves to the top of their ladder.

You may say that that is their business and not an engineer's. I don't agree with you; I believe that every engineer should, at the outset, put in several years in purely practical mining and milling. How many have done that?

It has been my good fortune, though I did not feel so at the time, to put in nearly four years underground as a miner; I feel that I know the superintendent, as a man, about as well as most engineers. Let me advise the coming generation of engineers to take every chance of becoming better acquainted with this man; he makes a good friend and a hard enemy. As a rule, at the outset, he won't like you, for he has had some bitter experiences with your predecessors, he has been snubbed, his ideas scoffed and his intelligence underrated, but "make good" with him by letting him know that his ideas are worth something, as well as your own, and your early troubles will be greatly lightened. This advice should be taken by many older engineers also.

To the past and present generations of engineers I should like to relate my methods of dealing with the type of man in question: I first try to gain his goodwill and friendship by talking upon some subject in common; if I am fortunate and succeed in gaining his friendship, we are upon solid ground, and I can get his ideas upon the locality, the mine, the orebodies and what not; I find that I obtain information that proves of great benefit to me, and in return I can give him a few good ideas; he is always glad to receive them, provided they are given in a friendly manner.

I am frank to say that I have received better treatment from this class of men than from those of my own profession; don't misunderstand me, I mean that I have received more good information on certain subjects of our profession from superintendents and foremen than from engineers whom I have met, and that information has always been given freely, with the earnest invitation to "Call again at any old time."

This is the spirit that should exist between the superintendent and the engineer, and in the long run I believe the engineer, as well as the superintendent, would be greatly benefited by such closer relations.

The requirements of a good mining engineer cover a wide field of study and experience—geology, metallurgy, surveying, mine valuation and numerous other subjects—but to my way of reasoning the qualifications that stand foremost on the list are good, business horse-sense, and an intimate knowledge of practical mining and milling. In the matters last mentioned, the superintendent can do worlds for you, if you will only get to know him.

Denver, January 10, 1906. H. R. PLATE.

Mining in Spain.

Mining in Spain has been stimulated by the high prices of copper and lead. There is a revival of interest in London, due chiefly to the favorable results so far obtained in the opening of the old Roman mines at Cerro Muriano, near Cordoba. John Taylor & Sons are the engineers and Henry F. Collins is manager, so that two old Cornish families are well represented. The former Roman workings were found to extend to a depth of 212 meters, but good copper ore has been discovered at the 250-meter level and the shaft is now being sunk to the 300-meter level. The mine is wet, a fine Hathorn-Davey compound pump being employed to raise 400 gal. per minute. The ore is copper pyrite and contains no precious metal.

Pozo Ancho Mine. Spain.

The accompanying illustration shows a new steel head-frame recently erected at the old Pozo Ancho mine of the Linares Lead Mining Company. It is 60 ft. high to center of sheaves, the lower third sheave being intended for the steam capstan that handles the pumps. The shaft is called Peill's shaft and is now down to the 1,680-ft. level. Double deck cages are used, winding being at the rate of 800 to 1,000 ft. per minute.

The old Alamillos and Fortuna companies are doing fairly well, the former having just bought a new property called the San Francisco, which had been worked to a depth of about 300 ft. twenty years ago. It is being re-opened and equipped with new machinery, with excellent prospects.

CONSUMPTION OF COPPER.—L. Vogelstein & Co. report the following figures indicating the German consumption of foreign copper for the months of January to November, 1905, as compared with the same period in 1904 and 1903:

	1905. Tons.	1904. Tons.	1903. Tons
Imports	100,793	107,364	80,093
Exports	11,114	8,145	9,328
Consumption	89,679	99,219	70,765

Out of the above, 83,992 tons were imported from the United States.

Electricity in the Black Hills.

The mines of the Black Hills, South Dakota, are about to receive the benefits of electric power. This is the greatest boon that has befallen the region since the introduction of the cyanide process. It will make possible the working of mines which hitherto have been too isolated or have possessed ore of so low a grade that it did not pay to work.

The new power plant completed at Pluma by the Consolidated Light & Power Company is thoroughly modern and best equipped. It has a stack, 210 ft. high, of steel and concrete, and a battery of seven boilers with a capacity of 2,200 h. p.; two 1,500-kw. turbines; one 500 and two 300-kw. turbines, and a total electrical power of 6,000 h. p. The stations are all built so that the boilers and turbines are in duplicate, each having its own individual condensing unit and auxiliaries. The switch-board will be six feet by 40 ft., having separate panels for the different power circuits. It will also have modern instruments for ascertaining conditions both on the line and in the plant. The company is now engaged in building a pole-line which will be 30 miles long, and when completed will connect the plant with all the mining companies in the northern Hills. Already the Lundborg-Dorr mill at Terry, one of the most successful and profitable plants in the district, is availing itself of this electric power. The Gilt Edge-Maid, which is also treating ore at a minimum cost, has electric power, not only for its mill, but for its hoist. This company and the Rex Mining Company have the only electric hoists in the Black Hills. A line is now being built for a large pumping station at the Ben Hur, one of the Horseshoe properties, and it is expected that by the first of June the work of connecting the various mining companies with the plant will be completed. It is estimated that the company will be able to furnish power from 20 to 50 per cent cheaper than it can be produced at the individual mines; the present cost of power to the mining companies is from 30 to 36 cents per ton milled, and electric power can be furnished for from 19 to 25 cents. When a company mills from 250 to 500 tons of ore per day, the saving of from 11 to 14 cents per ton will be no small item. It is not merely in the saving on low-grade ore that electricity will prove of benefit to the Hills, but it will also make it possible to operate properties that hitherto have been practically inaccessible. Big strides may now be looked for within the present year owing to these new facilities for operating low-grade propositions.

This electric plant also furnishes lights for Lead, Deadwood, Terry and Central. Mr. J. W. Springer has been in charge of the erection.

TO SECURE A PATENT IN MEXICO.—To secure a patent in Mexico the party making application (unless present in person), must furnish his representative with a letter of authority (*carta-poder*) in Spanish, signed by himself in presence of two witnesses. Ordinarily legalization by a Mexican consul is not required. Each application for either patent or trade-mark must be accompanied by a separate *carta-poder*. This must be accompanied by a full and complete description, and claims of, and for, the invention. If they are sent in Spanish ready for filing they must be in triplicate, on clear white paper 13 by 18½ in., written with typewriter on one side only of the paper, leaving on each sheet a left-hand margin of one-fourth the width of the paper. Drawings must be on white drawing paper equal to three-sheet Bristol, accompanied by two exact copies on tracing cloth, the size approximately 15 in. high by 10 in. wide, a heavy line one inch from the edges of the paper forming a rectangle within which the drawing must appear. A space of not less than one inch should be left above and below the drawings and within the rectangle for patent-office use. The drawings must be entirely free from signatures, writing, or marking of any kind except the letters or figures of reference to the specifications. They should be executed with the least possible number of lines or shading, and should be done with India or China ink. One of the drawings must show the complete invention. Drawings must not be folded. They should be sent flat or carefully rolled. Blank forms for letter of authority will be furnished to applicants by any regular patent attorney or solicitor. Any person desiring to obtain a patent may save all trouble and fully accomplish the object by communicating with the person whom he desires to have act as his representative or attorney, sending him the *carta-poder* duly signed and witnessed, a simple copy of his United States patent, or patent issued by any other country, or a copy of his specifications and claims written on a typewriter.

Radium is a substance which is perhaps millions of times more powerful than dynamite. Thus it is estimated that an ounce of radium would contain enough power to raise 10,000 tons a mile above earth's surface. Another way of stating the same estimate is this: The energy needed to tow a ship of 12,000 tons a distance of 6 000 sea miles at 15 knots is contained in 22 oz. of radium.

Block-Faulting and Its Relation to Ore Deposition.

Written for the MINING AND SCIENTIFIC PRESS by WALTER P. JENNEY.

It is in the Great Basin, lying between the Sierra Nevada and the Rocky Mountains, that block-faulting has its greatest exemplification. The region is characterized by numerous small mountain ranges coursing slightly west of north, conforming in general direction to the mountain systems on either flank. All of these are, however, not so regular in structure; interspersed, are island-like areas of diverse upheaval and associated volcanic rocks, which in some instances are productive mining districts. The peculiar structural features were early recognized by members of the United States Geological Survey and described as the 'Basin Range Structure.' The varied displacements of the strata by the more prominent folds and faults, the process of mountain building, and the evolution of the varied uplifts, are treated in detail in the monographs of the Survey. Little, however, has been written of the block-faulting incidental to the structural development of the Great Basin; most of the leading text-books on geology are silent on this subject.

Block-faulting is not confined strictly to the limits of the Basin, but occurs in the marginal ranges as well, and in many outlying areas of igneous disturbance in Nevada, southern California, Arizona, Utah and Idaho. It is also observed in the Black Hills of South Dakota and Wyoming, a solitary uplift in the great plains east of the Rocky Mountains—a region distinguished by the occurrence, at different geologic epochs, of volcanic outbursts giving rise to the formation of mineral deposits. Now that attention is drawn to it, there is reason to anticipate that block-faulting will be recognized in volcanic regions in other parts of the world. The intimate association of igneous rocks, and of block-faulting of the strata, with the occurrence of ore-deposits, is a subject which deserves careful study. In this paper, I will set forth the influence, in a special locality, of block-faulting in the preliminary preparation of the strata to receive the mineral, in the formation of the vein-fissures and verticals, and in the localization of the ore both in the fissures and in sheet-deposits replacing the stratified rocks.

The occurrence of this singular type of fault-structure is best understood by the examination of the conditions under which it has taken place.

First, there has been a distribution of intense volcanic energy over a broad basin or trough, almost continental in its extent, confined as if held between the jaws of a press, by the mountain systems on the east and on the west. Further, these mountain ranges are in themselves great fissure belts, zones of weakness in the earth's crust, the prominent 'feature-lines' of the North American continent. Dana, writing of continent-building, says: "These feature-lines have been successively developed with the progress of geological history—the system had its foundation in the beginning of the earth's genesis and was developed to full completion with its growth."*

Second, there are in the Great Basin evidences of many interrupted and recurrent volcanic outbursts; some at least, and possibly the larger number, were violent explosive eruptions, in contra-distinction to the quiet outpourings of lava which occurred in other localities, notably in the valley of Snake River, Idaho.

Third, the grandest exhibition of volcanic energy on this continent occurred during the Tertiary, and it is significant that most of the block-faulting has taken place during that period. It is probable that the larger proportion of the ore-deposits of the Great Basin are post-Miocene in age; the last geologic event of importance was the deposition of the ore. Post-mineral faults are rare; in some few instances, 'living' faults † occur which date back in origin to the earliest volcanic disturbance in the region—to eruptions, the time of occurrence of which we know little, except that they were post-Carboniferous. It is extremely rare to find in any of the mining districts of the Great Basin an igneous dike which has been intruded subsequent to the formation of the ore, although in a few places recent basaltic lavas are found only a few miles distant from mineral-bearing areas. Near Lost River and the Malad, in Idaho, in the marginal belt of the great Snake River lava-flow, there are extinct volcanoes, with outpourings of lava so recent that the rock is as fresh in appearance as if erupted in the last few centuries. In the monograph on Lake Bonneville, Gilbert describes similar recent lavas of southern Utah.

Fourth, the special dynamic disturbance causing the displacement was usually local, or, if regional, was of limited areal extent. In some instances the action was so sudden and violent that the strata were broken in blocks of immense size, without the lapse of sufficient time to admit of the rocks bending under the stress. In areas where the manifestations of dynamic force are greatest, disrupted blocks of strata, measuring 300 to 2,000 ft., and even more, across, are readjusted in positions such that the dip and strike of the beds in the several blocks is in diverse directions. Fractured blocks of less size are seen to be tilted, or set on edge, overturned, and less often are slid one over the other. This form of block-faulting is exhibited at Tintic district, Utah. An upheaval of Carboniferous limestone, two miles square, is surrounded on three sides by a much greater igneous area. At different epochs in the geologic history of that region, the sedimentary formation has been subject to abrupt compression produced by the intrusion of lava-masses in the volcanic border, and the consequent development of violent constrictive stress in the interior area. Large faulting-fissures cut the limestone into blocks, from one to ten acres in outcrop. The strike of the beds is often observed to change and the dip to be in a reverse direction in adjacent blocks. Naturally such abrupt changes in the stratification of the country have profoundly affected the course and dip of the veins in passing from block to block. There are, in the Tintic mountains, evidences of the occurrence of explosive volcanic eruptions, and other conditions which support the view that earthquake shocks may have been a factor in producing the fracturing. The movement of one wall of a fault-plane upon the other does not commonly take place all at once, neither is the motion uniform or continuous, but is interrupted and re-current; after a longer or shorter interval of rest, a sudden slip occurs, which produces more or less shock. That paroxysmal fissuring and faulting of the earth's crust give rise to earthquakes, is well recognized. It seems probable that the shattering and faulting

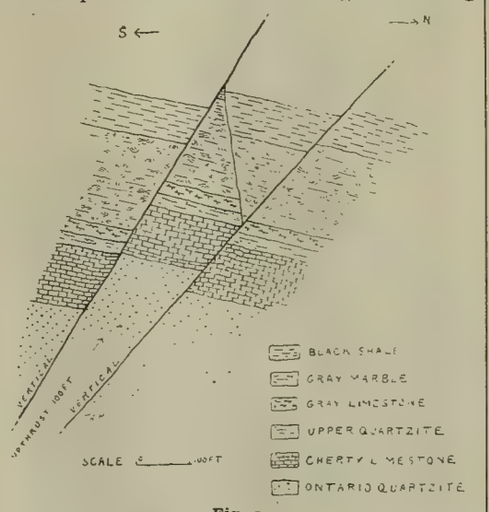


Fig. 1.

of any rock-mass under stress may be precipitated by such a shock. Further, the production of open fissures in the earth (in some instances miles in length) has frequently been observed to accompany the more severe earthquakes.

Where the conditions have been such that the dynamic effort has endured for a longer period, the strata are bent as well as fractured. A fine example of this is seen at Ophir canyon, Utah, where a dome-shaped uplift, two miles across, involving all the sedimentary formations of the mountain, is associated with block-faulting, which has caused comparatively little displacement of the bedding in the different blocks. Between the catastrophic type of block-faulting displayed at Tintic and the occurrence at Ophir of strata which have first undergone folding, and have been subsequently fractured, many intermediate forms exist.

Another type-form results from the subsidence of an igneous area at the conclusion of an eruption, due to the cooling and differential contraction of rocks of a diverse composition and structure, the re-adjustment of stress in the earth's outer crust, incident to expiring vulcanism. In some cases it is believed that during the progress of the eruption cavernous spaces were produced in the depths by steam displacing the molten lava and forcing it to the surface; with the dying-out of volcanic action, the collapse of the arch fractured and displaced the overlying formations. Block-faulting of this type may occur in the rocks surrounding a laccolith, and on a grander scale in mountain uplifts caused by the intrusion in the depths of the crust of immense masses of igneous rock. Russell describes this form of upheaval as "an uplift produced by a force acting from below directly upward, which has raised the strata into a dome." He advances the hypothesis that "they may have been elevated by molten magmas forced into the earth's crust, deep below the surface. The enlargement of these deeply seated bodies of intruded rocks may be likened to the growth of a tuber in the earth."‡ The term 'subtuberant mountains' is suggested. In some places it is observed, in approaching an axis of igneous upheaval, that a series of monoclinal folds of increasing intensity, giving rise to normal faults, is first passed over, succeeded by a down-thrown belt, in which the displacement is on the nucleal side of the uplift. Beyond the down-thrown belt a series of compensating faults elevate the strata, the block-faulting continuing until the volcanic nucleus is reached. Examples of this are seen in the Black Hills and along the flank of the Ontario mineral belt.

Fifth, the direction of the fault movement and the direction of the force producing it remain to be discussed. The most common form of block-faulting arises from the elevation of a region by a direct upthrust, followed later by compensating movements of subsidence. As has been stated, if the elevatory movement is slow and gradual, faulting may only take place in the re-adjustment of stress succeeding the uplift.

Examined in more detail, it is seen that block-faulting has been produced by a great variety of movements; often the displacements have resulted from a torsional stress,¶ and frequently in following a fault on its strike, the throw is found to increase or to diminish; such displacements are classed as radial. There are also overthrust faults and diagonal or 'splice' faults; 'wedge' faults are named from the shape of the displaced block.

In some mining districts faulting fissures are observed to radiate from one or more foci of dynamic effort (in this resembling the experiment of Daubree), and it is seen that often the largest orebodies are formed at such centers of multiple fissuring. The shunting of the throw from one fissure to another and the dispersion of the movement over a series of branching faults not infrequently takes place where the fissures intersect or are separated by narrow intervals, in this respect resembling shear-zones.

Block-faulting is commonly zonal or regional in occurrence and when produced by lateral thrust is characterized by the prevalence of reverse faults (compression displacements); when caused by less violent dynamic action, normal faults are most frequent, although in nearly every area where this structural form occurs, some reverse faults are found. It is seen that block-faulting is incidental to the development of the Basin Range structure, not only in the formation of great crustal blocks, but also in the subordinate fracturing and displacement; that it also occurs in the mountain chains contiguous to the Great Basin and in the Plateau region in association with igneous uplifts. It may result either directly, or incidentally, through the operation of any dynamic force. In many instances the law of normal faults that "the displaced block has gone down on the hanging wall of the fault, or that the corresponding block on the foot-wall has gone up," will apply to one side of an upthrust block, but not to the other. Such a condition is seen in the sketch of the upthrust block in the Daly–Judge mine (Fig. 2), where a block of strata is included between the normal fault and its companion, a reverse fault.

The standard works on structural geology and ore deposits, recognize shear-zones, but with this exception consider fault displacements, not collectively in groups, but singly, as if each individual fissure stood alone and did not form a unit of a complex system. The usual classification is one of form, based upon the direction of the throw, or upon the attitude of the fault, whether vertical, inclined or horizontal. A few are classified genetically, most important among which are the normal faults caused by gravity; there are also displacements due to the dilation of a rock, like peridotite, in its alteration to serpentine, and other displacements produced by the shrinkage of a sedimentary formation during solidification.

In conclusion, it has been shown that block-faulting may be local, confined to a limited area or district; or that it may be regional, occurring over a great basin; or that it may be zonal and pervade the fissure-belt of a mountain chain. That the system may include, among its units, almost every kind and description of faults, as well as occasional rare forms which have escaped classification. It should be borne in mind that in working out the details of a system of faults, the blocks of strata, considered with reference to their relative position are the important thing; the faulting fissures are only of interest (unless they are veins bearing ore or verticals which have brought in the mineral) in limiting or defining the boundaries of the several blocks.

Block-faulting may be defined as a phase of volcanic disturbance, giving rise to a system of faults with diverse displacement, which, according to the nature of the eruption which gave them birth, may be local, regional, or zonal in its distribution.

The Ontario mineral belt occurs where the Wasatch range, with a north-south trend, crosses almost at right angles and is superimposed upon the older Uinta mountain system. The east-west axis of the Uinta uplift has determined the general course of the mineral belt and of the more important ore-bearing veins, while the cross-veins conform to the structure-lines of the Wasatch range. Notwithstanding that this mining region is situated in the heart of a mountain chain some 30 miles away from the Great Basin, there is displayed a most interest-

* 'Characteristics of Volcanoes', by James J. Dana, p. 363.

† Faults which at the present day are subject to occasional though small, re-current movement of one wall upon the other are termed 'living faults'.

‡ 'Volcanoes of North America,' by Israel C. Russell, pp. 104–105.

¶ The experiment of Daubree in twisting a rectangular plate of mirror glass on which a coating of paper had been glued, affords a remarkably good illustration of block-faulting resulting from torsion. "He obtained two systems of cracks running obliquely to the plane of torsion." Beck's 'The Nature of Ore Deposits' (Weed's translation), pp. 171–172.

ing exhibit of block-faulting and of the inter-relation of volcanic disturbances, of post-igneous faulting and of ore-deposition.

Structural Features Produced by the Block-Faulting.—In the Daly-West and Daly-Judge, the faulted blocks of strata, united, form a triangular prism or wedge, base downward, traversing these mines in a southwest direction. This wedge-shaped structure is impressed by the relative position and the dip in an opposite direction, of the extreme bounding veins of the central fissured belt. On the north side is the Daly vein, dipping at 75° to the northwest, on the south side is the Back vein, dipping at 60° to the southeast. All the veins, fissures, verticals, and porphyry dikes of these mines are enclosed within this faulted wedge. Owing to the intimate relation and dependence of the ore deposits upon the faulting fissures through which the mineral has been introduced, all the ore now developed in these mines is similarly included. See Fig. 2.

The width of this fissured belt, measured from the Daly vein, southward to the Back vein, on the 900-ft. level of the Daly-West mine, is 1,700 ft. Assuming the dip of the veins bounding the wedge to continue uniform, and projecting them to the surface, the belt would there be narrowed in its outcrop, to a breadth of 400 to 500 ft. by the truncation of the upper edge of the wedge, due to erosion. Higher on the divide, the outer fissures may unite before reaching the surface.

Future exploration will undoubtedly develop outlying fissures in this mineral belt, both to the north of the Daly vein and to the south of the Back vein; but the larger prism that they make, without regard to the form its cross-section may assume, will include the fault-wedge described. (This actually occurs in the western part of the Ontario mine and in the Daly ground, where the prism is a parallelogram in cross-section, bounded by north-dipping veins). The interior structure of this wedge is marked by the occurrence of long and broad gently inclined troughs, formed by the subsidence of great blocks of strata, and bounded by the more prominent veins and faulting-fissures of the belt. Of these the most important is the main ore-channel, or 'Trough,' which is 900 to 1,000 ft. broad and more than a mile long. At the extreme east it is now being followed in the Daly property; there is reason to anticipate the extension of this trough in that direction through the ground along the south flank of the Ontario lode. In the workings of the Daly-Judge mine, this main channel, together with the down-thrown block or trough bordering it on the south, is continuing in ore, westerly. The fault-wedge has proved to be remarkably persistent throughout the mineral belt, and my opinion is that these sunken troughs will be found to be ore-bearing (where the local conditions were favorable for the deposition), so long as the union of the special geologic formation and the fissured zone continues.

The contour of the underground surface of the quartzite floor has had a strongly marked influence in limiting and defining the position of the ore deposits in the beds of gray limestone which rest upon it. The waters depositing the ore, on entering the strata, found the underground country with substantially its present faulted structure, and in their flow followed these troughs between the uplifted blocks, as if in a broad, shallow stream between high banks. The contact in the elevated blocks bounding these depressed troughs is seldom mineralized. In a number of places in the main channel the upper surface of the quartzite is polished and striated by the horizontal movement of the beds, which have slipped one upon the other. The direction of these lines of movement is north 60° to 70° east, conforming to the general course of the trough.

Prior to the mineral deposition, the rocks were prepared for the reception of ore by the fissuring of the strata, by the shattering of the beds in proximity to the verticals, by the breaking up and crushing of the gray limestone itself owing to drag of the beds one upon another, caused by the horizontal movement of the faulted blocks in the adjustment of diagonal upthrust and downthrow. Afterward these fissures and crushed beds were permeated by the wide-spread circulation of the mineralizing solutions, introduced through the verticals. In places where different fissures converge and intersect, the richest and largest bodies of ore are frequently found. This concentration of ore about centers or areas of fissure-intersection appears to result from the more complete and extensive fracturing and brecciation of the beds. The junction of the fissures tended to keep open the channels through which the solutions entered. This local concentration of ore in spaces of multiple fissuring holds equally true with respect to ore-shoots in the veins, formed in like manner by the intersection of the main fissure by verticals having different courses.

In no mining region is the general law of mineral deposition more rigidly followed, namely, that "*All workable deposits of ore occur in direct association with faulting-fissures traversing the strata, and with masses or beds of crushed and brecciated rock, produced by movements of disturbance. The undisturbed rocks are everywhere barren of ore.*" So true has this proved to be that it may be said, "*No ore deposit exists without a fissure or channel in the rock through which the mineral-forming waters were introduced.*"

Fig. 2

Vertical Section of Daly-West Mine on Line of 900-Ft. Level, South Crosscut.

All dislocations preceded deposition of ore. Geology by WALTER P. JENNEY.

Lord Kelvin has shown that if a drop of water were magnified to the size of the earth the molecules of water would be of a size intermediate between that of a cricket ball and of a marable. Now each molecule contains three atoms, two being of hydrogen and one of oxygen. This molecular system probably presents some sort of analogy with that of a triple star; the three atoms, replacing the stars, revolving about one another is some sort of dance which cannot be exactly described.

Communities of atoms are called chemical combinations, and we know that they possess every degree of stability. The existence of some is so precarious that the chemist in his laboratory can barely retain them for a moment; others are so stubborn that he can barely break them up. In this case dissociation and reunion into new forms of communities are in incessant and spontaneous progress throughout the world.

Method of Exporting Chinese Coolies to the Transvaal.

Consul-General Ragsdale, of Tientsin, describes a system established, with the approval of the Chinese Government, for the enlistment of coolies for work in the mines of the Transvaal. The wages range from 1s. 6d. to 2s. 6d. per day, exclusive of subsistence, for the supply of which the contract makes provision. Mr. Ragsdale says:

During the last year a new industry has been introduced into China, and more particularly into north China. This is the exportation of indentured coolies to the Transvaal as unskilled laborers in the gold mines of the Witwatersrand district. Since the close of the South African war it has been found that the supply of native Kaffir labor was insufficient for the full development of the mines. Unskilled white labor has been tried on some of the mines, and has always resulted in failure, for the following reasons:

The climate is not suitable for the white man as a laborer.

The cost of living is so great that, for a white man to live in decency with his family, the wages necessary are much greater than the mining conditions will justify and the mines could not be worked. White men working for wages justified by the mines must be content to live in such a manner that they soon become degraded, lose their self-respect, and become a serious social menace.

It has been proven an impossibility for white and black laborers to work side by side.

Indian laborers have been tried without success. They are not good miners, can do but a small amount of work, and their strict rules of caste make it difficult to handle large bodies of them in an alien country. When the mines were re-opened, after the close of the South African war, the schedule of wages was less than before the war. As the lack of labor became a serious matter, the wages were increased in the hopes that the available labor would increase. These hopes did not materialize. The habits and instincts of the Kaffir are the same as the other natives of Africa. None of them are workers beyond what is absolutely necessary for a hand-to-mouth existence. Four or six months' work in the mines provides them with sufficient means to live the remainder of the year. The increase of wages instead of improving the labor conditions had an opposite effect, as the Kaffir could obtain the requisite amount of money in less time.

In addition to all this there is the fact that even if the native labor was satisfactory there are not a sufficient number of natives available. The entire population available for native workers is less than 4,700,000. As only those between the ages of 15 and 50 will undertake outside employment, the selection is limited to 10%, or 470,000. Dividing this by two, as the natives will not work more than six months each year, there is a total available supply, in the districts where recruiting is allowed, of 235,000. The present shortage in the Transvaal in all industrial and agri-

cultural operations is 220,000. The number of natives employed is 182,000, thus leaving only 53,000 to supply this immediate shortage, which in the Transvaal mining industry alone is 130,000. Thus will be seen the necessity of recruiting from some outside source, and from all sources available the most favorable is China, particularly north China. The Chinese are quiet, sober, hard workers, not given to dissipation of any kind, economical and thrifty, anxious to save all their wages possible and eventually return to China.

It must be remembered that the cost to the South African mining companies of the Chinese coolie is much greater than the cost of the Kaffir, and that the profit, if any, will consist in the greater capacity of work in the individual and the increased security of the mine owners against unexpected shortage. This experiment with indentured Chinese labor is the result of a thorough investigation of the labor question by the Transvaal Chamber of Mines, and the carrying on of the work in China is in the hands of a labor importation agency appointed by this Chamber of Mines. This work was sanctioned by the British Government by the passing of the Transvaal labor importation ordinance. The commissioners of the Transvaal Chamber of Mines arrived in China during the winter of 1903 and at once commenced negotiations with the Chinese Government in Peking for permission to export coolies. After completing in a satisfactory manner these necessary arrangements the commissioners inaugurated the actual work of collecting the coolies. Contracts for this work were given to two British firms in Tientsin—William R. Forbes & Co. and Chinese Engineering & Mining Company. For each coolie delivered at the port of embarkation and passed by the medical examiners a fixed sum is to be paid these contractors. The contractors pay all cost of collecting the coolies and supplying them with food and transportation to the point of delivery. Any coolies failing to pass the physical examination are a loss to the contractors. The contractors at once, through their *compradores*, established collecting stations in various parts of the provinces of Chihli and Shantung, from which went out small agents to preach the gospel of the Transvaal and collect coolies. The first shipments were collected from Tientsin and Tongshan; as the coolies were numerous and near. Later, as the coast supply decreased, the agents pushed inland.

The inland collecting stations were usually at some town having a resident foreign missionary doctor, who made a preliminary examination of the coolies before they were sent to the coast. This examination was at the expense of the contractors. The accepted coolies were marched to the nearest railway station and forwarded to the shipping point. In a short time Chinwangtao was made the main shipping point and an immense depot was established there. Near the beach, but well above the reach of the sea, was built a large compound, surrounded by a high brick wall. In this compound are 16 separate barracks, each 100 by 45 ft. with walls some 20 ft. high On the two sides of these are two wooden platforms six feet wide, one above the other, extending the entire length of the building, which are of brick, plastered on the inside, a lath and plaster ceiling, and cement floors. They contain ample windows and doors and in winter are furnished with large coal stoves—better quarters than the coolies ever had before.

The coolies arrive in lots of from two to three hundred and are placed in a small detention compound. Each one is stripped and examined by the doctors. This physical examination is most thorough, including tests for eyesight and hearing. Those accepted pass into an immense tank of warm water and are scrubbed with soap. They are then vaccinated, photographed, and their identification cards written up. A number is hung about their necks and they are ushered into the large compound, where they remain until the next transport sails. In the meantime they are furnished with a copy of the contract they are to sign both in Chinese and English. At all hours of the day special Chinese clerks take them individually and explain each clause of the contract in the simplest manner possible and in every detail, until each coolie understands where he is going, for what purpose, and under what conditions, and in what manner he will be repatriated.

These Chinese instructors are under the control of the Chinese protector, a British government official in no way connected with the Transvaal mines. His duties are to see that until the coolie leaves China the white man adheres, both in letter and spirit, to his part of the contract; that each coolie understands what engagement he is entering into, and that he enters into this engagement of his own free will and not because of outside pressure. While waiting for the transport the coolie, for the first time in his life, does no work, and has not a care, is clean, and has all the food and tea he wishes. He has no opium and no Chinese spirits. The change in the coolie is marvelous; he straightens and squares his shoulders, the wrinkles of worry disappear, and he simply exudes contentment. The shipping of the coolie is a slow process, as each must be examined by the doctors on the day of embarkation, and about four hundred per day is the limit.

The day before shipping, the coolies are taken in lots of ten to the office of the Chinese protector for a final examination in the catechism of what they are about to contract for. The questions asked are many and cover every possible point on which could hang a misunderstanding. These questions are propounded until all understand, when the coolies are thus addressed: "If there is any coolie here who regrets having come and does not wish to go to South Africa, let him come forward. Any of you are at perfect liberty to go home now if you so choose. There is no punishment and no money for you to pay if you have changed your minds. You have only to tell me and you may walk out of the compound and go home. The only requirement is that you leave Chinwangtao within twenty-four hours." Only about one in two hundred leaves at this point, and any excuse he may give is accepted by the Chinese protector.

The next day is the final medical examination and shipment. In a large hall stand or squat some two

Tongshan, China.

hundred coolies in rows along the wall. Their only clothing is a piece of string and a paper tag. In the next room are the doctors and Chinese clerks. The coolies come in one by one. They are compared with their identification card. If passed, they cross the room to a Chinese clerk who checks their name on the roll. They are then passed into the next room and

Office of Chinese Engineering & Mining Company.

into the tank, through which warm water constantly flows. Here they leave behind all remnants of Chinese dust, and, passing into the dressing room, put on new clean clothes, shoes, belts, socks, straw hats, etc , and re-appear in dark-blue uniforms, no longer mere Chinese, but wearing on the front of the coat in Chinese characters the legend *Nan Fei Li Kung.*

Chinese Making Bricks at Tongshan.

In the next room are three desks with Chinese clerks and a foreign supervisor. At the first the paper tag is changed for a lead disk with a number on it. This is fastened about his neck, and he is sent to the desk at which he arranges for a portion of his wages to be paid in China each month, to his wife, father, or other person designated by him. This is done by means of a coupon pass-book. Next he goes to the most interesting desk of all, the paymaster's. Here he receives $38 (Mexican), two months' pay, and $8 bonus. The majority never owned a silver dollar before. The money is laid out and counted in front of him. It is then pushed into a small tin pan, which will later serve him as a rice bowl, and he is passed to the next room, where he signs his contract, before which, however, he has one more chance to retreat if he so wishes. No one has ever retreated at this point.

The next room is a long hall divided lengthwise by an iron grating. On the one side the hall opens into the outside world; on the other into the compound. It is here that the South African laborer bids farewell to his family and creditors. It is not a pathetic sight. If his creditors leave him any of his newly acquired wealth his relatives argue with him for it, and fortunate the coolie who escapes to the next room with any money. Here he receives his kit bag containing a full winter outfit of clothes, blankets, a tin cup, and everything he can possibly need on the trip, including a small bamboo pillow with folding legs to serve as a seat by day. They walk out with their bags on their backs, enter the train, and are taken at once to the dock, where they are changed to a waiting lighter and towed to the transport. Everything is clean and comfortable for them. Rules prescribe the number allowed on each transport, and they sail away with no work to do for a month and all they can eat. They are a most cheerful crew.

Following are the results of this new industry to the present. The first shipment of coolies was made from south China in May, 1904. The total number of shipments from all ports to date is 29. The total number of coolies shipped from all parts of China is approximately 49,000. Of these, 28,000 have been exported from Chinwangtao and 5,500 from Chefoo. The number of deaths during the voyage have been only three or four per trip. In reference to the mortality among the coolies after arrival in South Africa, I am unable to procure exact data, as the records of the 15,500 shipped from south China are not available in Tientsin. But from statements published in Johannesburg the health of the coolies has been eminently satisfactory, with the exception of those exported from the southern provinces. This difference was so marked that all exportation from the south was soon stopped and only the strong, rugged northerner is now taken. Of the 33,500 taken from the north less than 300 have died from sickness. The total deaths have been 15.5 per thousand, of which 2.4 per thousand were due to accident. The number repatriated at the expense of the mines has been about 1,000, of which 204 were from the north. Less than 50 have returned to China at their own expense. Of the total number of coolies sent to Chinwangtao those rejected by the doctors after examination have amounted to about 30%, thus showing great care used in final selection and to some extent the lack of care in the collecting.

THE PROSPECTOR.

The small pieces of ore from Santa Ana, Cal., are lead and zinc sulphide.

The minerals from Ashland, Or., are: No. 1, from near hanging wall, quartz with pyrrhotite (magnetic iron sulphide); No. 2, center of vein quartz; No. 3, quartz with rotten granite; No. 4, quartz. This is not the real hanging wall, but a portion of the vein, and should be crosscut to the granite.

The ore from Darwin, Inyo county, Cal., is sphalerite (zinc sulphide), also called blende and black jack. The matrix is a dike rock.

Sample No. 1, from Palmetto, near Lida, Nev., is a silicified eruptive rock, in which is seen some very finely disseminated pyrite (invisible without aid of a strong glass) and some crystals of iron oxide. No. 2, from the same place, is largely limonite (brown iron oxide). This ore will contain iron and copper sulphide in depth, and possibly other sulphides as well. Both ores may contain gold and silver and should be assayed.

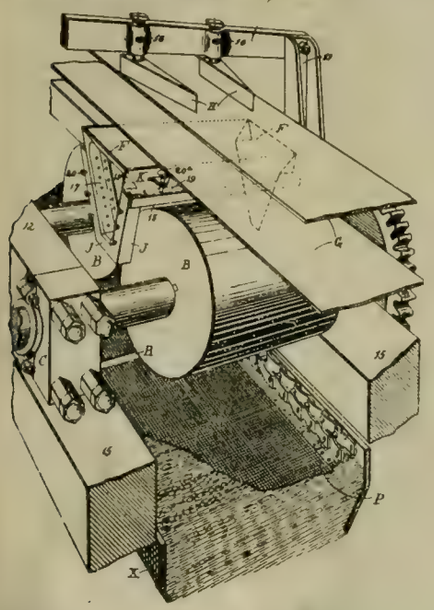
The rock samples, marked 'P. A. B.,' from Mexico are the following: No. 1, an altered, feldspathic intrusive rock, in which occurs numerous small crystals of hornblende. Pyrite also is seen disseminated and incrusting the fracture planes in the rock. This rock is probably a fine-grained syenite. No. 2 is a brecciated limestone. The fact that thermal springs exist in its vicinity does not necessarily indicate that the rock was deposited by the calcareous waters of the spring. Its appearance, on the contrary, leads to a contrary belief. No. 3 is quartz, in which appears a few small crystals of actinolite (hornblende). No. 4 is hornblende granite; that is, granite in which appears both hornblende and mica. No. 5 is syenite. No. 6 is aplite (micaless granite). No. 7 is a very much decayed granitic rock. The black mineral is tourmaline. No. 8 is lava (andesite). No. 9, 10 and 13 are the same kind of rock (norite), the bisilicate being mostly hornblende. No. 12 is apparently tuff, which has been somewhat metamorphosed, either by local causes or the metamorphism may be regional in its character. No. 11 has the appearance of dacite that has been subjected to intense pressure, resulting in slight deformation. Every crystal of quartz and feldspar has been shattered by the pressure, but has had only slight movement and little or no shearing. The ground-mass is much decayed.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 9, 1906.

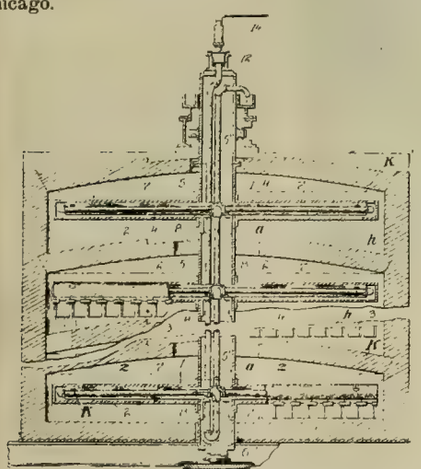
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

COMBINED APPARATUS FOR GRINDING OR CRUSHING, WASHING AND SEPARATING ORES. — No. 808,488; R. Stanley, Nuneaton, England.



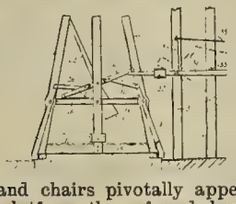
Apparatus for treatment of ores, comprising rolls between which the material is reduced to a coarsely ground condition, finishing rolls adapted to allow only a thin layer of material to pass between them, a traveling belt of gauze underneath the finishing rolls to catch the material falling therefrom, means for forcing the crushed material through the gauze into a trough below, means for redistributing the material that cannot pass through the gauze to the finishing rolls for regrinding.

ROASTING FURNACE.—No. 808,293; F. E. Marcy, Chicago.



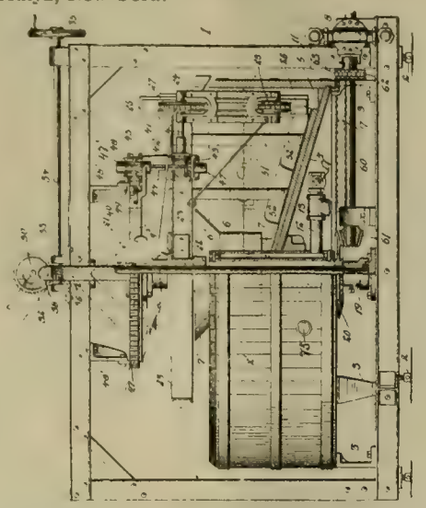
In a furnace having a plurality of hearths, a hollow rabble shaft passing through the hearths, a series of structural members radiating from the shaft and extending into the several hearths, a series of hollow arms passed over and supported by the structural members and forming air spaces or conduits therewith, an inlet pipe and a return in the shaft for conveying a cooling medium into and out of shaft, and a series of branches leading from the return into the conduits of the arms and enveloping the structural members within the arms for cooling members and arms.

LANDING CHAIR FOR MINING CAGES.—No. 809,176; G. H. Denton, Denver, Colorado.



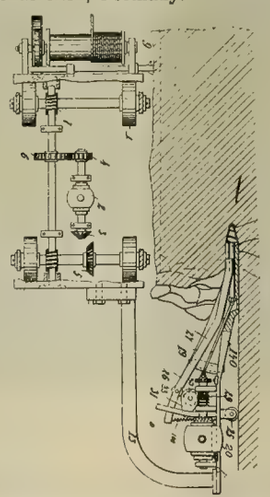
A cage, and chairs pivotally appended to cage, above the platform thereof and having horizontal portions below their pivots with seats disposed beneath platform of the cage.

GOLD-SEPARATOR.—No. 809,586; E. J. Sterling, Brooklyn, New York.



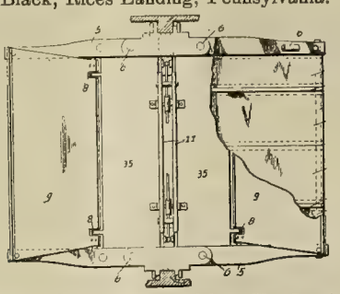
In a gold-separator, the combination of a tank, a circular rack above tank, a pipe projecting up through tank and having an exterior annular chamber provided with outlet-openings leading into tank, a rotatable shaft extending upwardly through pipe, means for operating shaft, a hub rotatable with and slidable on shaft, means for sliding hub on shaft, arms secured to hub, elevators rotatably mounted on arms, laterally extending shafts for operating elevators, shafts rotatably mounted on arms and having gears on their inner ends and upwardly extending shafts rotatably mounted on arms and having gears on their lower ends meshing with the gears on the laterally extending shafts and gears on their upper ends rotatable therewith and slidable thereon and meshing with circular rack.

COAL-MINING MACHINE.—No. 809,350; C. Wissemann, Gelsenkirchen, Germany.



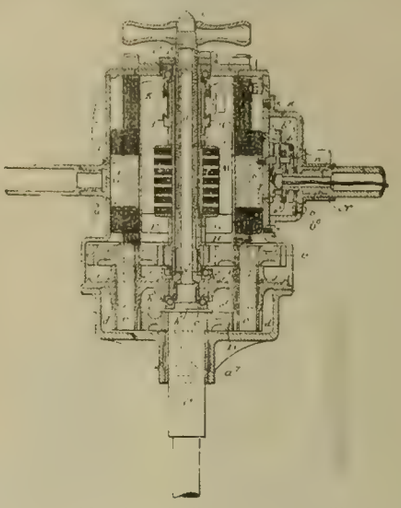
In a coal-mining machine, combination of motor-engine, with a series of borers arranged vertically one below the other and acting to drive holes parallel to the joints of the layers of coal, plates acting in the manner of wedges, the front ends of which enter the bore-holes, and means to rock plate on a pivot at forward ends.

CAGE FOR MINE AND ELEVATOR SHAFTS.—No. 809,899; W. Black, Rices Landing, Pennsylvania.



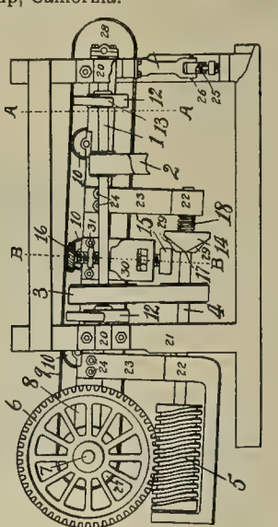
A cage of the type comprising sills, flooring supported by sills, flooring consisting of channel-shaped plates and braces extending through the depending edges of plates, through sills a track supported on flooring, bolsters from which the sills are supported and vertical and oblique braces connecting bolsters with sills.

ELECTRICALLY OPERATED PORTABLE DRILL.—No. 809,394; A. Pedersen, Cleveland, Ohio.



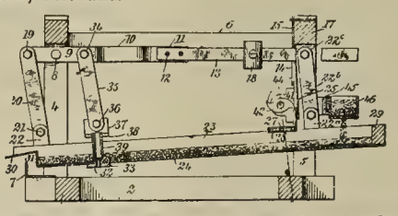
In a portable electrically operated drill, the combination of a multipolar motor provided with a casing and mounted within the latter and having a hollow shaft; a feed-screw mounted within and co-axial with shaft; a drill-spindle mounted in one end of the casing and having its axis in the same straight line with the motor's axis; a removable head secured to the other end of casing; intermediate gearing connecting motor and spindle; a diaphragm located transversely of line of the motor-axis, one end of shaft being supported by head and the other by diaphragm; binding-bolts passing through head and between separate field-sections and having their inner ends secured to diaphragm; and a controller for motor having its resistance coils mounted upon binding-bolts.

FRUE CONCENTRATOR.—No. 809,648; L. R. Tulloch, Angels Camp, California.



In a concentrator, the combination of a shaft, means for revolving shaft, a worm thereon, a frame, drums on frame, an endless concentrating belt around drums, a worm-wheel meshing with worm and operatively connected with one of drums to revolve it, and positive means independent of the connection with worm-wheel for imparting a longitudinal reciprocation to shaft, whereby is produced a comparatively rapid oscillation of the worm-wheel and a corresponding longitudinal reciprocation of the belt in addition to its slow advance.

ORE-CONCENTRATOR.—No. 809,765; G. M. Whitney, Lawson, Colorado.



An ore-concentrator, comprising a bed for the ore to be separated, tubes therethrough for the discharge of the mineral portions of the material, other tubes having movable relation with first-named tubes for regulating such discharge, a supporting member for the second-mentioned tubes, and a vertically-swinging member connected with the supporting member.

A New Gold Dredge.

Written for the MINING AND SCIENTIFIC PRESS by GEORGE L. HURST.

The gold dredge, like the trusts, continues to grow larger and larger, and the day is not far distant when we shall see dredges with buckets each holding one cubic yard. This tendency to enlargement is indicated by a dredge provided with buckets of 7-ft. capacity recently built at El Dorado, on the American river. This machine will dig from a depth of 35 ft. below the surface of the water and elevate tailing to 38 ft. above water, so that it can work a bank at least 15 ft. above water level; in other words, dredging is possible to a total depth of 50 feet.

The hull is 94 ft. long, 34 ft. wide, and 30 ft. deep. The increased width over the 5-ft. dredge is very noticeable and makes the boat much more comfortable. The main ladder consists of a heavy plated girder with ½-in. side-plates, 42 in. deep in the center and tapered off to 30 in. at each end. The lower end carries a pentagonal cast-steel tumbler lined with manganese-steel wearing plates on both the treads and flanges.

The shaft is provided with special steel bushings and revolves in the hardest kind of white iron bushings enclosed in a cast-steel cap, which prevents the grit and water getting in the bearings. The ladder end proper is made of heavy cast-steel side-plates heavily flanged and ribbed, and riveted to both angles and side-plates of the main ladder. The ladder is provided with steel chafing-rollers running against the steel plates bolted to the hull, which gives a smoother motion than beams and reduces the wear and tear to a minimum. The bucket-belt travels upon manganese-steel rollers running in enclosed grease-cup bearings, which system of lubrication is used for all parts subject to water and grit, and has proved successful.

The bucket-belt consists of 37 heavy substantial buckets, each of 7 cu. ft. capacity, with a wide open mouth so as to facilitate dumping. These buckets have locomotive tire steel links with manganese-steel bushings and 1 in. flanged steel bottoms. The back and end are made in one piece, being flanged in a special press, thus doing away with the end piece which is always working loose and losing valuable material, to say nothing of the cost of repair. This back is also re-enforced with a heavy side-plate. The lips are of manganese steel 9 in. wide and 1½ in. thick. The buckets are connected together with cast-steel links and forged manganese pins, these pins running in manganese-steel bushings. The top tumbler, which drives this bucket-line, is square and almost solid. The shaft is a special grade of steel to withstand heavy shocks. The tumbler body is made of cast steel and the wearing corners of manganese steel clamped to same with square bolts.

The main and side gantries which carry the tumbler and countershafts are of steel throughout and have proved absolutely rigid. This would seem to be an unnecessary expense, but the extra first cost will be far more than counterbalanced by the increased stability over wooden gantries, especially in a dry climate. However well the timber is fitted, the excessive heat and dryness cause the joints to shrink, which necessitates constant tightening up of bolts, etc. The main top tumbler bearings are of cast steel and form an integral part of the steel gantry, thus doing away with sole-plates, keys, and bolts.

The main bucket-line is driven through a chain of gears and one belt by a 75 h. p. variable speed motor taking a 3-phase alternating current at 440 volts. The average horsepower consumed is about 40 h. p. when dumping 12½ buckets per minute. The material drops into a steel delivery plate which delivers it into the revolving screen. After the buckets dump they are washed out with two jets of water, one on each side. Any material which does not fall on the delivery plate is caught on what is called the save-all grizzley, which is below the delivery plate and runs further forward, and the buckets are again washed out by more jets, thus cleaning them thoroughly before they leave the dredge to pick up another load.

The revolving screen is 4 ft. 6 in. diam. by 30 ft. long, perforated with ⅝-in. holes. The perforated plates are carried on T bars and one or all of these perforated plates can be taken out without taking the screen down, thus enabling new wearing plates to be put in without delay. The screen carries at its lower end a heavy cast-steel ring. Under this ring is a cast-iron self-contained bed-plate carrying friction rollers driven by steel bevel wheels, all bearings being brass bushed and having the end thrust taken up by fiber washers. The brasses are made interchangeable and reversible. The top end of the screen also carries a cast-steel tread which revolves on cast-steel rollers running in cast-iron chairs bolted to main steel gantry. The screen is driven by a 10-h. p. motor through a belt and a set of cast-steel gearing. The motor is situated above the screen and out of the way of all splash and dirt.

The revolving screen delivers the coarse material direct to the stacker buckets by means of a flat shoot. These stacker buckets are of the Risdon standard type; they are carried on manganese-steel rollers supported by steel I-beams. Both top and bottom tumblers are cast steel and fitted with renewable steel corners. The top tumbler is driven by a 10-h. p. motor situated at the upper end of the elevator on a steel frame above the line of buckets. A belt connects this motor with a set of cast-steel gearing. Placing this motor up at the end of the elevator does away with a long rope drive and the steel I-beams are more than sufficient to carry the little extra weight of the motor.

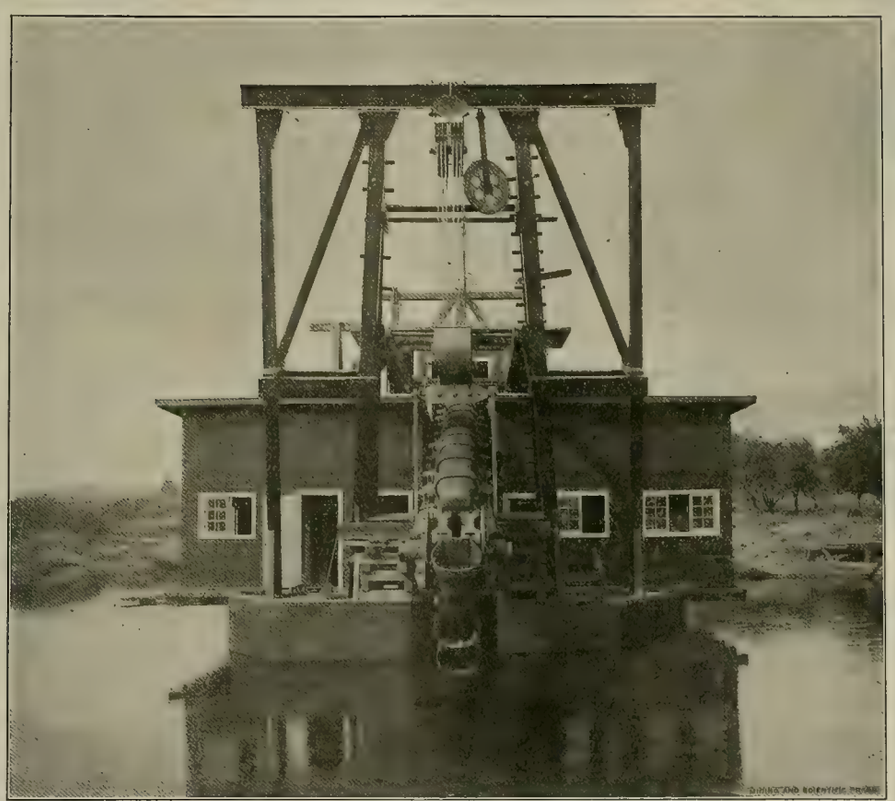
The water supply is furnished by a double centrifugal pump of special type, direct coupled to a 50-h. p. motor delivering water into the revolving screen and distributing box. The pump which delivers water into the revolving screen is called the high-pressure pump and the one which delivers water into the distributing box is termed the low-pressure pump. The pipe in the revolving screen is fitted with a set of nozzles 1¾ in. diam. instead of the old method of a plain perforated pipe. The water from these nozzles retards the material from passing too quickly through the screen and also breaks up any sticky material. The pressure of the water in this screen pipe is much higher than in the pipe which delivers the water to the distributing box, thus making the reason clear for using two pumps in place of one. The pump being direct-connected to the motor and designed to run at the correct speed does away with all belt troubles, etc. The distributing box consists of a steel box fitted with a patent distributing plate and adjustable side doors. This delivers the material equally, not only on both sides of the screen but equally to each table. The fine material which passes through the perforated screen falls onto this distributing plate, then passes to the various openings on the sides of the distributing box and then over the gold-saving tables fitted with matting and expanded metal. These tables are in two lengths and have a mercury trough between each length. The material from the tables passes into the sluice ways fitted with angle-iron riffles.

The winches of this dredge are practically steel throughout. All gears and pinions are steel, the high-speed ones being cut gears to do away with friction losses and unnecessary noise. The main winch is driven by a 15-h. p. variable speed motor which allows the winch to be operated as desired. The operating handles for this winch work in quadrants of the locomotive type and are all brought to one platform, one handle for each of the four side-line drums. The design is such that the movement of one handle enables a drum to be instantly set in motion, allowed to run loose, or held by the brake. Each drum is entirely independent and can be operated in any way regardless of the conditions of the other one, whether driven loose or held. This prevents any delay in changing positions of the dredge and together with the independent ladder winch increases the actual capacity of the dredge probably 30% over the old style.

The head line is operated by a slow running drum, the line passes from the drum to a snatch-block ashore and returns to the other side of the dredge, giving a steady but powerful advance to the dredge and also distributing the digging load onto both pontoons.

The ladder winch is entirely independent and consists of a 20-h. p. variable speed motor fitted with brake and controller, by which the ladder can be raised or lowered. All the machinery is housed in with a flat roof covered with canvas. Above the screen there is a second story which makes a nice store-room and gives one a good opportunity to watch the moving machinery. At the forward end of the starboard pontoon is situated a gangplank supported at the outer end from the top of the front gantry by a set of small blocks and hand winch. This gangplank can be raised and lowered so that it is unnecessary to take a boat to get on board the dredge, and when not in use it can be raised out of the way.

The whole of the plant is of the most substantial design. The ladder and buckets loaded weigh 45 tons and the steel gantry 28 tons. The average daily capacity of this dredge is estimated at 3000 cu. yd. bank measurement. The crew consists of two men per shift and the power used about 95 to 100 h. p.; the daily cost of wages, electric power and up-keep ought not to exceed $100 per day. The dredge has in the neighborhood of 250 tons of machinery on board and costs about $75,000 in complete running order.

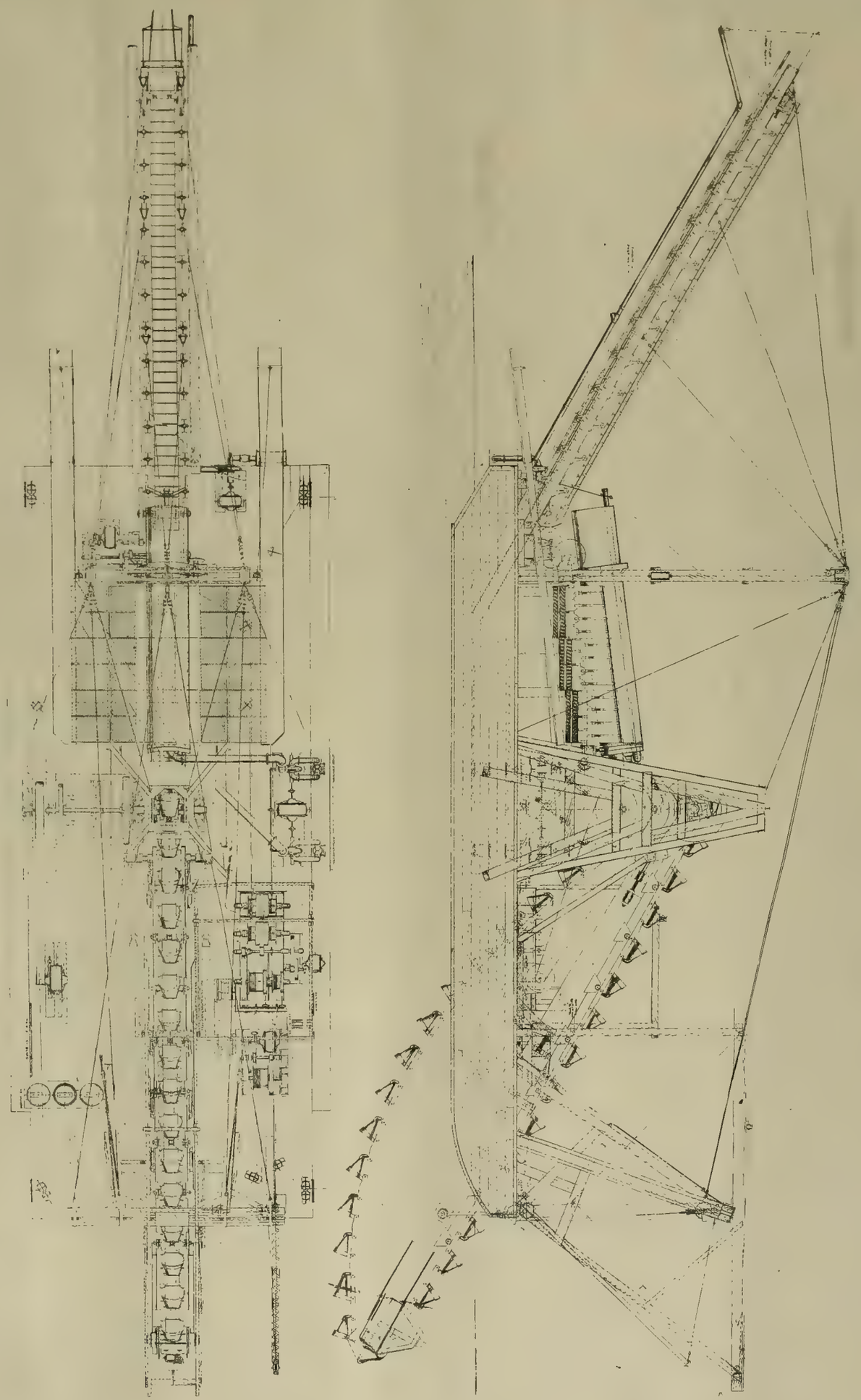


New Dredge at El Dorado, on the American River.

BENDIGO SADDLE-REEFS.—There is no replacement of the country rock by quartz; the opposite sides of the jagged walls of the 'spurs' in many cases would fit closely if joined again. The quartz is milk-white and almost glassy; it would be regarded with much disfavor by many miners of this country and contemptuously designated as 'bull-quartz.' Extremely little evidence of pressure and crushing is seen. Quartz with thin intercalated sheets of slate is not uncommon, and this occurrence, as well as many other facts, lends much support to the view, also advocated by Mr. Dunn, that the expanding force of crystallization has aided in creati ng the necessary cavities for deposition. Carbonates containing lime, magnesia and iron in places mingle with the quartz and very frequently line the walls of the fissures. To some extent these carbonates also replace the slate adjoining the veins. Chlorite is sometimes found embedded in the quartz to which it imparts a dark greenish tinge. It is well crystallized in minute bent and curved prisms. The sulphides are generally limited to pyrite and arsenopyrite, with a little galena. The two first-named minerals seem most abundant in the slate immediately adjoining the quartz. At the contact, cubes of pyrite are sometimes seen, of which one-half is embedded in quartz and the other half in the black slate.—W. Lindgren, in *Economic Geology*.

THERE is a tendency to increase the weight of stamps in the South African mills. At the Simmer & Jack the falling weight of the new stamps is to be 1,415 lb. Several companies have ordered stamps of 1,350-lb. weight. This development is accompanied by the use of tube-mills, a rapid coarse crushing in the battery being followed by re-grinding in tube-mills.

THE unusually good photograph of the Old Dominion smelter at Globe, Arizona, appearing in our issue of December 23, was contributed by Mr. George H. Twaites of Globe. By an oversight this acknowledgment was omitted.



THE EL DORADO DREDGE.

Built by The Risdon Iron & Locomotive Works, San Francisco.

Designed by R. H. Postlethwaite.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

LONDON, January 6, 1906.

When the other night at the Albert Hall the new Premier launched his diatribes against "Chinese Slavery" and roused an appreciative audience (very few of whom probably held Kaffir shares), many supposed that South African mining had received a very bad one in the eye. The market, however, appears to regard such political fireworks as of less significance than the new Colonial Secretary's statement that the Government will retain its freedom of action until the local voice on the subject can be properly heard. Beside, it is now contended on high legal authority announced in the *Standard* that the ordinance for the importation of Chinese coolies, passed by the Transvaal Government in February, 1904, and sanctioned by the King, has become law and cannot be revised, except by His Majesty alone in Privy Council. Meantime the supporters of indentured yellow labor are bestirring themselves to educate public opinion. The Imperial South African Association, in connection with which no less a personage than the Duke of Westminster lends his great wealth and personal influence as President, has called to its aid the powerful advocacy of two prominent members of the Progressive Association of the Transvaal—Messrs. Reid and Rodgers. These gentlemen, while declaring that they have a perfectly free hand, indicate, by opinions already expressed, their strong conviction that unskilled whites cannot possibly meet the demand for cheap labor in the Transvaal for the development of the mining industry so absolutely necessary to support the increasing white population. Messrs. Reid and Rodgers insist on the proposition that even if a sufficient native supply were available, it would be useless for future competitive work owing to its temporary and intermittent character. On the other hand, they point out that unskilled white labor is an impossibility in South Africa owing to the great cost of living. At the same time whites never will do Kaffirs' work, for should the white man lose his status before the natives, civil war will ensue. This argument is brought home by the reminder that the white population of the Transvaal is only 303,000 against 1,250,000 natives. Truths such as these from men thoroughly competent to speak on the subject should be sufficient for the thoughtful section of electors; but all the same, ignorant clamor and wilful misrepresentation will probably continue to be heard until the General Election is over. Meantime the South African mining industry goes steadily on, as evinced by December dividends—a goodly and substantial list—and by the increase (over £5,000,000) in the yield of gold from the Transvaal during the past year.

While the apathy of the general public in regard to Kaffir shares continues, the interest in American and Mexican mining is perceptibly growing. Activity and strength are the order of the day in the great copper shares, such as Anacondas and Bostons. In gold mines, Camp Birds, which, owing, it is said, to some rather heavy selling from your side, lost color at the end of the year, are again showing a firmer market, the quarterly distribution just made being one shilling per share compared with 9d. for the corresponding quarter of the previous year. The information available here concerning the mine leaves something to be desired from the shareholder's point of view, but according to reliable opinion, it is likely to maintain its high character as a regular and generous producer for years to come. The same remark as to mining data is applicable to Esperanza, but it may well be said that there cannot be much the matter with a mine that shows profits running from £75,000 upward for months on end. Those in the know predict that this sort of thing can be maintained for a prolonged period from ore reserves already blocked out. If so, the present price of £5⅜ cannot be described as excessive on merits, having regard to the relative smallness of the share capital—£455,000. El Oros are well maintained. There are great expectations from its new subsidiary—Somera—formed with a nominal capital of £500,000, of which £226,000 is working capital; in this undertaking El Oro Company, of course, retains a substantial interest.

Another Mexican mine, the Dolores, is gradually coming into favor. This mine is in the Guerrero district, State of Chihuahua. The directors of Dolores Limited (a flotation of the Venture Corporation), after a long wait of nearly two years, have issued a report. As a rule directors who know, or think, they have a good thing in hand are not bashful in showing up its good points, but all they have to say on the subject in this instance is that the mine belongs to Dolores Mines Company—the American Company. The report is a model of brevity. Profits? Oh dear no!, the "American Company" not having yet paid any dividends on the shares (nearly the whole of them) held by Dolores Ltd. The chapter—a history of one year and eight months in a dozen lines or so—is thus closed with an almost audible sigh of relief. That dividends are lacking is clear enough from the accounts of Dolores Mines Company which are appended to the meagre balance sheet of Dolores Ltd., the latter showing net liabilities amounting to some £2,500, to be cleared off out of future dividends which may come in. The accounts of the American Company show at a glance the inadequacy of the working capital of $145,500 as originally "received from stockholders." It has had to be supplemented by loans amounting to some $200,500. This amount presumably must be paid off together with a sum of $50,000 due under a contract (for what purpose it is not stated) before profits become available for dividends. The operating account is for two months only—the last of the 13 months to June 30, 1905, covered by the accounts. It shows a net profit, after providing for all working expenses at the mine and New York charges, of $8,997.55. Shareholders are left with the reflection that from small beginnings large issues may result. They will naturally turn from the accounts to the Consulting Engineer's report to see if some more inspiring thoughts can be made to flow from that fountain of information. Although no great enlightenment awaits the casual reader of this document, a careful observer may gather more than a few grains of useful knowledge from the material spread before him. The mine has an ample area—227½ acres with surface rights to some 12,500 acres affording a good supply of water and timber. Since the purchase, the equipment of the property has been of considerable importance, comprising as it does hoisting and air-compressor plants, pumping engine, two miles of pipe-line for water supply to the mill, all the buildings and the mill itself. The whole of this material had to be transported for a distance of over a hundred miles from the nearest railway station on mule-back through the mountains, with the trail on the higher summits repeatedly buried in snow and in the valleys rendered impassable by unprecedented floods. In spite of these difficulties, Mr. John B. Farish is able to boast that disinterested engineers who have seen it pronounce the equipment one of the finest sectional plants in the Sierra Madre mountains. The mine appears to be in an equally satisfactory condition. The former owners left a legacy to the company of 26,831 tons of ore in the reserves besides 11,000 tons on the dump, originally valued at $55 and $42 per ton, respectively, U. S. currency, divided about equally between gold and silver. The reserves have more recently been valued by Manager Hardy as averaging $66 per ton and it is also found in stoping ore for the mill that the vein is fully 20% wider than estimated. The orebody worked on the main, or Alma Maria, vein has been proved to extend for a length of about 600 ft. to a depth of over 400 ft. from surface, the bottom level being in rich ore. The main tunnel level intersected the Alma Maria vein at a vertical depth of 250 ft. from surface. This level in its extension north beyond the proved orebody, after passing through barren ground, encountered pay-ore for a distance of over 160 ft.; giving evidence, in the opinion of Mr. Farish, of being the top of a second ore-shoot. Besides the main vein there are other veins with a showing at surface similar to the Alma Maria vein. These are to be prospected in good time. The mill consists of a battery of 15 stamps, amalgamation pans, Bryan mills, tube-mill, etc., and cyanidation plant for the tailing. The mill started in May last and the Consulting Engineer expresses great satisfaction with its work so far as the amalgamation part is concerned and with the recovery, which he expects will be at least 85% of the gross values, when the cyanide plant is at work early in the new year. With regard to future profits Mr. Farish only states that they will come up to the estimates of the experts. What those estimates were is no secret as they were made known by the promoters of the company as somewhere about £100,000 per annum—or say 30% on the capitalization of £330,000. The capacity of the mill is stated in the report as at least 50 tons per day. The ore reserves with the dump are thus about two years ahead of the present milling. All this leads to the conviction that shareholders in Dolores Ltd. will be rewarded for their patience before very long by substantial dividends from the American company. This expectation is shared by the market, the price of Dolores Ltd. shares standing at £2½, with practically no sellers.

In connection with another sphere of mining industry, the Australian Smelting Corporation Ltd. has been formed in London this week with a capital of £350,000 in £1 shares of which 300,000 are offered to the public for subscription at par. Briefly stated, the company's sources of profit will be from (1) the Zinc Corporation Ltd. silver-lead concessions, (2) Broken Hill silver-lead concessions, (3) the Caledonia copper ores, (4) general smelting of other ores and concentrates, (5) the production of sulphuric acid, (6) the manufacture of fertilizers and other by-products. The managers are Messrs. Bewick, Moreing & Co., one of the firm—Mr. H. C. Hoover—being on the board. It is considered by those who are competent to judge that the Australian Smelting Corporation promises to be another Broken Hill success.

CALUMET, January 20, 1906.

Every indication points to the probability of the fire which broke out in No. 2 shaft of the Tamarack mine last week having been smothered. While a considerable quantity of gas still lingers in the workings, there is barely any discernible at the mouth of No. 2 shaft or No. 1, a short distance away. The fire started in an abandoned stope at the 22nd level. The timbering was very heavy at that point and as dry as tinder, furnishing a large amount of material for fire. As the draft would prevent the flames working downward, and there are no active workings above the point where the fire started, it is not thought that the blaze extended beyond the 22nd level workings. While this is the most serious fire ever experienced by the Tamarack, it is fortunate that the loss of life was not larger. Nearly 700 men were working in No. 1, 2 and 5 shafts when the fire started. The men were taken from the mile-deep workings in an incredibly short time, and the clear-headed heroism of not one but many officials and common miners is deserving of mention.

No. 2 shaft, in which the Tamarack fire started, is 4,400 ft. deep and the richest portion of the property. It was shipping upward of 1,000 tons of rock daily. Owing to the smoke and gases arising from the conflagration in No. 2 shaft, it became necessary to discontinue operations in No. 1 and 5 shafts. The former is not an important producer, shipping a few hundred tons of rock daily from the Osceola amygdaloid bed, which is reached by means of crosscuts. Originally the shaft secured its production from the Calumet conglomerate, for the purpose of opening which it was sunk, but the conglomerate was exhausted some time ago. No. 5 is one of the deepest and most important shafts of the Tamarack property, furnishing a large tonnage of rock of fairly good quality. As No. 3 and 4 shafts, known as the North Tamarack branch of the mine, are not connected with the company's other shafts, the fire had no effect on their operations. Work continued on the usual scale, No. 3 shaft furnishing 1,000 tons of rock daily and No. 4 a small quantity.

While scores of miners have lost their lives in the Lake Superior copper district through mine fires, not one of the number has been burned. Not a single one has even had his clothing scorched. In every case death has been caused by suffocation from noxious gases produced by the burning timbers. The amygdaloid mines have but little timbering underground, but in the conglomerate mines, such as the Calumet & Hecla and Tamarack, the treacherous hanging walls above the copper-bearing strata necessitate heavy expenditure for timbering in order to safeguard the lives of the miners. Amygdaloid mines, like the Isle Royale, Osceola and Quincy, have strong rock walls and use little timber, nevertheless, the loss of lives from fires in the amygdaloid mines has been greater than in the conglomerate properties.

In its operations on the Osceola bed the Calumet & Hecla is driving drift-stopes the full width of the vein and about 12 ft. high. This provides an adequate rock supply for the mills and furthermore furnishes a thorough test of the lode's copper-bearing values as the work progresses. In this manner an accurate estimate of the stoping possibilities of the remaining ground is made possible. The drift-stopes follow the lode in all its turnings and much dead-work is thus eliminated.

It is learned from well-informed people that Walter Fitch is likely to assume the management of the Keweenaw Copper Company's work in Keweenaw county. Mr. Fitch has had more than twenty years' experience in the iron mines of the Lake Superior region. He resigned from the superintendency of the Clairton Steel Company's interests in the Lake district, which includes the Champion iron mine in Michigan and important properties on the Minnesota ranges, to accept the general managership of the United States Mining Company. The latter company's properties in Utah and California make it one of the most important copper concerns in the country. Mr. Fitch resigned from the United States Company three months ago, owing to his freedom of action being restricted, and since that time has been acting as consulting engineer at Salt Lake for important private interests. The need of a man of Mr. Fitch's abilities at the head of the Keweenaw Copper Company is recognized, as the concern is likely to develop into an important copper producer.

This week marks the inauguration of active work on the Old Belt property in Ontonagon county, recently taken over by the Lake Copper Company. The shaft on the Knowlton lode will be unwatered. The showing in this shaft is reported to have been excellent when the property discontinued operations, much copper being in evidence in the bottom. There are a number of promising copper-bearing formations traversing the property and these will be investigated by means of the diamond drill.

P. O. Wells, superintendent of the Lake Superior Smelting Company's plant at Dollar Bay, has resigned to take a position with the International Ore Treating Company. Mr. Wells will be superintendent of the concern. John T. Morrow, formerly manager of the Greene Consolidated, is general manager.

According to present plans, the Victoria mine, in Ontonagon county, will start regular production in March. Work on the power plant has advanced sufficiently to warrant this statement. Air power will be used exclusively in the operation of the stamp-mill, hoisting machinery, power drills underground and various shops about the surface of the mine. As the cost of fuel will be eliminated, it is expected that the mine will show low operating costs. The Victoria mine is extensively developed, the management estimating the ore available for stoping being sufficient to supply the single head in the stamp-mill for five years.

President H. F. Fay of the Centennial and Allouez companies is in the Lake district inspecting the mines with which he is associated. Both the Centennial and Allouez are increasing their production steadily, each having the entire use of one head under the latest arrangements. Carroll Watson, copper expert, with Dane, Smith & Co., of Boston, is in the Lake district inspecting mines. J. Q. Bennett of Burham & Bennett, Boston, was here this week to look over the Tecumseh mine. Quincy A. Shaw of the Calumet & Hecla Mining Co. has returned to Boston after a brief visit.

Sinking in No. 6 shaft of the old Osceola branch of the Osceola Consolidated Co. is under way below the forty-third level. There is a large area of undeveloped ground tributary to this shaft on the south, and it is expected that important developments will result when the drifts reach that portion of the property. It is planned to install a compressor of large capacity at this shaft during the current year. No. 5 shaft, the only other active shaft at the old Osceola mine, is furnishing approximately 400 tons of rock daily, the copper returns being satisfactory. No sinking is being done in this shaft at present.

ALASKA.

J. A. Murphy, the president of the Latouche Island Copper Mining Co., has arrived at Valdez en route to Latouche island, with men and supplies to continue work on the property.

ARIZONA.

The Territorial Supreme Court on January 20 handed down its decision in the mandamus proceedings brought by Attorney-General Clark against the Board of Supervisors of Yavapai county *et al.*, known as the mine tax cases. This decision is a practical victory for the Territorial Board of Equalization, though the court points out the fact that the proper course was not pursued. Raises made are not to be effective for the year 1905. Certiorari case brought by the Copper Queen Mining Co. was decided adversely to the mining company. Appeals are to be taken to the Supreme Court of the United States. Believing that the assessment of patented mining properties as returned by the county assessors was too low, the Board of Equalization last summer ordered raising of the valuations to what it

thought right. As the different counties had made different valuations in order to arrive at an equitable higher assessment, the Board of Equalization made a different, but, as it believed, just raise in the different counties. That is, the raises were uniform, but started from different standards. Part of the counties stood the raise and collected the taxes accordingly. In other counties boards of supervisors refused to make the raises, and the Board of Equalization brought mandamus suits against them in the Supreme Court. At the same time the Copper Queen Co. of Bisbee brought certiorari proceedings against the Board of Equalization to compel it to show its authority for its action.

Cochise County.

A coke shortage threatens the hoped increase in copper production. No shutdown is likely to occur. Snowstorms in New Mexico are said to have delayed cars in transit.

The damage to the Tranquility shaft-house, Tombstone, through the fire of last week, amounted to $5,000. The flames were kept from entering the shaft. More sinking pumps are being installed in the Tombstone main shaft.——Last week another cave-in occurred in the Commonwealth mine at Pearce, filling up old workings, but not materially injuring the more modern drifts and stopes.

Superintendent B. M. Pattison, of the Shattuck-Arizona and Denn mines, has returned from his visit to Duluth and St. Paul. At meetings of the directors it was decided to put in a larger hoist at the Shattuck, widen the shaft and build a tramway. At the Denn mine the main shaft entered limestone at 840 ft. Sinking will go straight ahead to the 900 level, where a station will be cut. The 1,000 level will then be made, when another station will be cut.——At the annual meeting of the stockholders of the Cochise Development Co. in Bisbee, it was decided to continue the west drift from the 300-ft. level. Sinking will be carried on at the same time.

Gila County.

D. P. Fuller, superintendent of the Pinto Creek Mining & Smelting Co., will put in a concentrating plant of 100 tons capacity at the Yo Tambien mine, near Globe.—— The Inspiration Mining Co. has made arrangements with the Old Dominion Co. for the treatment of its ore. It is expected that ore shipments will commence Feb. 1. ——At the Starlight mine, south of San Carlos, Superintendent F. A. Weast is mining and shipping.——The Castle Dome Development Co. is working claims of the Old Dominion Co., near Globe, under direction of Richard Rosskilley. A shaft 4x8 ft. will be sunk to a depth of 1,000 ft.——The Montezuma Copper Mining Co. is working claims west of the Live Oak mines, near Globe, with Charles Maybush as superintendent.

Mohave County.

The stockholders of the Grand Gulch Mining Co. have given an option on their copper property in Mohave county, south of St. George, Utah, to W. J. Guthrie of Butte, Mont., representing Butte & Boston capital. The workings at the lowest point are 435 ft. deep, reached by a double-compartment shaft. A new station cut at the 400-ft. level is in ore. The development on the old Adams claim has been accomplished through a tunnel 3,000 ft. in length, with drifts.

The hoist on the Merrimac mine, at Chloride, is being put in commission and the mine will be unwatered.

Pima County.

The Helvetia Mining Co. is drifting on the 500-ft. level at Helvetia.

Pinal County.

Work on the Lake Superior & Arizona mine is suspended, pending the arrival of pumps to handle water, which has come in on the 300-ft. level of the winze being sunk at the junction of two tunnels previously run into the mountain. The company plans building a smelter near Florence, on the Gila river. So far, progress at the property has been handicapped by its inaccessibility, the distance to rail at the present time being 30 miles, Florence being the nearest point.

Yavapai County.

The Western Queen Mines Co., which owns claims near Poland, has started work.

After a short shut-down for repairs after a six months' run, the furnaces at the United Verde mine at Jerome have been blown in.——The Prudential Mining Co. intends to resume work on its claims five miles east of Dewey.

Bradrick & McKinnon have taken a lease on the slag dump at the old Val Verde smelter, and will break it up, sort it over and have the slag that carries copper values smelted at the Arizona Smelting Co.'s plant at Humboldt.

The main shaft at the Verde King mine, at Jerome, is to be sunk 200 ft. deeper.——Near Prescott, the Continental Consolidated Mining Co. has let the contract to crosscut the Golden Standby vein at the 80-ft. level.—— About 75 men are sinking shafts on different claims in the new Carrigan district. Redmond Toohey, who has taken a bond on six claims in the district that adjoins those of Carrigan, is preparing to do extensive development work.

T. S. Henderson & Co., of St. Louis, have purchased a controlling interest in the Great Belcher mine, near Providence. The machinery and other property at the mine has been sold and heavier machinery will be installed.——A hoist and air compressors will be installed at the Copper Hill mine at Copper Basin, near Prescott, by Manager Symonds.

The Tiger Mining Co. is projecting a narrow-gauge road from the Crown King depot to its property.——The Mount Union Consolidated Gold Mining Co. has begun building a tramway to connect the mill with the wagon road on the summit of the mountain. It will be 2,500 ft. long and will enable the teams between the property and the Poland railroad station to make two trips daily instead of one.——The Triangle Mines Co. at McCabe has struck ore in the bottom of a shaft 100 ft. deep.——R. C. Houston has struck shipping ore in the Olden mine, 12 miles from Kirkland.

J. S. Carmichael, superintendent of the Pine Mountain Mining Co. of Prescott, reports that the 10-stamp mill is running day and night. The main shaft is down 500 ft. When cold weather is over sinking will be resumed.——Wm. Theising reports that his mill at Turkey is running day and night. A cyanide plant is to be put in to work the tailing.

C. E. Finney, general manager of the Arizona Smelting Co. at Humboldt, states that the 400-ton concentrating plant at Humboldt will be ready to start March 7th. Contracts have been let for a lead smelter, and the company will begin buying lead ores.

CALIFORNIA.

Amador County.

Underground work has been resumed at the Zeila mine, near Jackson, after the hoist framework had been repaired. The full capacity of the 40-stamp mill has been started. There is ample water.——T. C. Mayon, F. M. Clark and W. D. Clark, owners of the Clark-Mayon gravel mine, near Oleta, have made application to the Debris Commission for permission to mine that claim by hydraulic process.

Contra Costa County.

The Point Lewis smelter is now running full blast, with a working force of 200 men.

The Southern Pacific Co. has closed a contract with the Guggenheim smelter people by which they are to ship their ores from Nevada and Mexico over the Southern Pacific line to Port Costa, from which point they will be loaded on vessels and taken to the refinery at Tacoma, Wash. For this purpose the company is to rebuild its coal bunkers in the Port Costa yards.

Humboldt County.

P. L. Young and associates, who are operating a mine between Virgin and the head of Eagle creek, are arranging to put in an electric plant on the creek below, and are negotiating for the construction of an aerial tramway.——John Hennessy, owner of the Hunter mine at Whiterock, has leased the Ridgeway 10-stamp mill and has constructed a tramway from the property to the mill.

Inyo County.

It is expected that the 10-stamp mill at the Montgomery mine of the Pleasant Canyon Mining Co., near Ballarat, will be finished by March 1. The 50-ton cyanide plant has been started on the tailing pile. W. P. McComas has charge.

Los Angeles County.

The Lowell & California Mining Co. has completed a water well at Palmdale. In the spring the company will instal a 400-h. p. electric plant. The present 10-stamp mill will be replaced with one of 70 stamps.

Nevada County.

The Ironclad mine, near Grass Valley, is being renovated preparatory to starting sinking and drifting.

Placer County.

The Al Gol mine, eight miles northeast of Lincoln, will be re-opened by John T. Cairns, of San Francisco, who has a bond on the property.

San Bernardino County.

The 5-stamp mill of John Carroll near Victorville has been completed and is in operation.——The stack on the dust chamber for the roasting furnace at the Arizona-Mexican Mining & Smelting Co.'s smelter at Needles is finished. The company has purchased over 2,000 tons of oré, which is bedded and ready for smelting. Dr. L. D. Godshall, general manager of the company, is at Needles.

James Tisnerat of Long Beach has bought of James Malony the Copper Glance copper claims No. 2 and 4, two miles north of Lane's Wells.

San Diego County.

Orders have been received at Julian to shut down the reduction works, the High Peak and the Helvia mines, pending advices from Los Angeles.

Sierra County.

(Special Correspondence).—The long wished for storms have arrived. There is from 15 to 20 ft. of snow on the summits, but the rain extended high enough to furnish plenty of water for the drift miners to wash their dumps that have been accumulating since last fall. The heavy storms have caused some delay with the drill that is prospecting on Mount Fillmore for gravel.——The Herkimer mine near Table Rock, under the management of H. R. Fowler, is making good progress with the tunnel and will be in gravel before spring. —— The White Bear, near Downieville, have begun to breast again.—— At the Hilo mine, near Downieville, they are washing their dump and taking out good pay dirt. —— Morse Bros. at Eureka have been drifting. The banks caved last week, covering up their blacksmith shop, timbers and tools. —— Wm. Brady has struck soft rock in his tunnel, near Downieville, and discontinued the use of his power drill. —— The Last Resort have their tunnel in 200 ft. and are now putting up an inclined raise for air. —— At the Telegraph mine they have their electric power plant in full operation and have started to sink on their ledge.——Humphrey & Myers of San Francisco have taken an option on the Twin Eagle at Gold Point and have put a crew to work. —— The Oaklick mine have discontinued operations. They have sufficient development done till they build their mill in the spring.——The Empire in Gold valley, which closed for a short while on account of shortage of water, has started again. —— The Mountain mine at Sierra City has temporarily suspended operations owing to an accident to the tramway. —— The Marguerite, near Sierra City, is running a drain tunnel. When this is completed they will resume sinking. —— Richard Phelan of Sierra City failed to get all the machinery for his electric plant in before the roads closed, which has retarded development.——The Sierra Buttes at Sierra City have resumed operations, having repaired the old 20-stamp mill and completed the new 40-stamp mill and tramway.——At the Sovereign tunnel, near Downieville, they intend to build a mill as soon as the weather will permit. —— George Morrison is preparing to open up the Primrose.

Downieville, Jan. 22.

Shasta County.

The Kette Mining Co., which owns the Clara mine, between Taylor and Keswick, has two shifts sinking the main shaft, which is down 75 feet.

Siskiyou County.

W. R. McDowell, one of the owners of the Mulloy claims on Tanner's Peak, near Sawyers Bar, is driving tunnels on the vein, blocking out ore, and he expects to put in a mill in the spring.

Tulare County.

S. W. Steffner, one of the operators of the Josephine mine, is at White River, superintending the installation of the new mill, which will be in operation the first of February.

Tuolumne County.

Lester Wiley, superintendent and general manager of the Big Creek Gold Mining Co., operating near Groveland, has let a contract to open up 30 miles of the old Rock River ditch, which will facilitate mining in and about Groveland.

E. M. Carr, of Tuolumne, has purchased the hoisting machinery and buildings on the Bown mine, near Tuttletown.

The Black Oak mine, at Soulsbyville, has been started up.——The App mine, at Quartz, has resumed operations.——Albert Baier, of Columbia, and W. G. Phipps are in San Francisco arranging to start the Columbia mine, in Experimental gulch.——Heath & Grim have put in Pelton wheels to run the mill, concentrators and compressor at the Mt. Lily mine, at Columbia.

Yuba County.

The American Smelting & Refining Co. has purchased the Dempsey copper mining properties near Smartsville, and will erect large smelter works there on the line of the California Midland Railway to be built from Grass Valley and Auburn to Marysville.

COLORADO.

(Special Correspondence).—It is reported the Phelps-Dodge company have purchased land in the southern part of the State and will develop the coal lands.——An appropriation of $2,500,000 is being asked for from the Government for a new Federal building for Denver.—— During the past week several sections of the State have suffered from snowslides, and some lives lost as a consequence. On account of the extreme warm weather, the slides are running much earlier than common. Some places all communication has been cut off from the mines in the outlying districts.——There is being some effort put forth among some of the mining men of the State to establish a mining bureau similar to the one now in existence in California, where mining men can obtain accurate and practical information regarding the mining industry.

Denver, Jan. 22.

Clear Creek County.

Lougee & Hill, who have a lease on the tunnel, or 10th level of the Lamartine mine, near Idaho Springs, have a good showing in the winze, which has been sunk 50 ft. below the tunnel level. An electric plunger pump and an electrically operated hoist are being put in, and drifts will be driven east and west from the winze.

The Charter-Raton mine, two miles from Empire, is to be worked under the direction of C. H. Morris. —— Ratholtz & Wing have a lease and bond on the McLyman group on Leavenworth mountain, near Georgetown, and have started to clean out and retimber the crosscut and drifts preparatory to working the property. —— The Dunkirk Mining & Leasing Co., of which James H. Crandell is the general manager, are pushing work on the old Dunkirk property at Silver Plume.

Estelle & Co. have a lease and bond on the Richmond group, owned by the Woodley brothers, on Griffith and Saxon mountains, near Georgetown.

Gilpin County.

The shaft on the Mineral Hill property, in Moon gulch, near Central City, has been unwatered and cleaned out to its depth of 200 ft. Sinking is to be resumed. W. H. Knowles, of Denver, is manager.

At the Pozo mine in Nevada gulch, near Central City, new flues have been put in the boiler and repairs made to the shaft-building. The water is out to the depth of 160 ft. and the shaft is to be sunk another lift of 50 ft. The main operations are being carried on in the 140-ft. level. To handle the water station a compound pump is being put in at the second level and a tank 6x7x18 ft., having a capacity of over 5,000 gal., is to be put in at the same point. A. M. Rucker is manager.——Sinking has been resumed at the Mackey-Burroughs mine on Quartz hill, near Central City, and the present lift of shaft will make it a total depth of 1,050 ft.——Manager J. C. Fleschhutz of the Pewabic Consolidated Gold Mines Co., operating the Pewabic and Iron mines in Russell district, near Central City, has ordered a five-drill air compressor and a 7x10 Blake crusher. The new machinery is to be put in at the Iron shaft. The shaft is to be sunk deeper. The present daily average is 50 tons, all of which is treated at the New York mill at Black Hawk. ——Glanville & Peeck are putting up a new shaft-building for the Fairfield mine, near Central City, which is the second erection during the past two months, the former one being destroyed by a wind-storm, and the one previous to that being destroyed by fire ——At the Sleepy Hollow mine in Gregory district, near Black Hawk, which is being operated under the management of J. F. Hopkins, the water has been lowered to below the seventh level. The intention is to continue the work of lowering the water to its total depth of over 800 ft. and then of sinking the shaft to the 1,000-ft. point, but for the present developments will be confined to the seventh and upper levels, owing to the heavy expenses of taking out the water during the cold weather.——At the Gaston mine on Bates hill, near Central City, under a lease from the Arrighi estate, they have sunk the shaft to a depth of 210 ft., working

at a depth of 115 ft. They have shipped ore to the Buell mill. They are using a whim for hoisting, but may put in a steam hoisting plant.——Two shifts are running at the Buell mill in Mountain City on account of the increased supply of ores from custom mines.

Gunnison County.

Hendricks & Memson, leasers on the Cortland mine in McIntyre gulch, near Gunnison, have broken into rich ore on the 150-ft. level south.——The Grand Prize group in the Gold Brick district, above Ohio City, is showing rich ore.

Lake County.

Bardwell & Smith are opening up a large body of gray copper ore in the Emerald Isle group, on the Lake Fork river, near Lake City. A level has been started west from the bottom of the 160-ft. shaft.

Ouray County.

Wahl & Hupps have sold out their interest in the Neodesea lease, near Ouray, to Arps Bros., who will continue operations with an increased force. The present shaft will be sunk 100 ft. deeper and drifts run to open up stoping ground. The property adjoins the Wedge holdings, in the Bachelor district.

San Juan County.

Five Italian miners employed at the Sunnyside mine lost their lives in an immense snowslide on Jan. 22. —— No trains from Durango or Denver have arrived at Silverton since Jan. 17, due to slides and immense drifts of snow which have blocked the tracks. All the short line roads running to outlying camps are snowed in. There are 11 slides between Silverton and Elk Park. The slides average from 7 to 30 ft. deep and from 50 to 450 feet wide. One immense slide went into the Animas river, forming a dam of snow and ice, which caused the stream to back up and overflow the Rio Grande tracks to a depth of four feet. The Iowa mill, in Arrastra gulch, has been crushed in by heavy snowslides which came down Little Giant mountain.

San Miguel County.

A strike of rich mineral is reported on the property of the Black Bear Mining Co. in Ingram basin, five miles southeast of Telluride. In the spring the mine will be equipped with a mill, tramway, air compressor and hoist and thereafter worked on an extensive scale.——Improvements are being made on the rag plant at the Liberty Bell mill, one-half mile above Telluride. When the new process for the treatment of the ore was adopted in the mill about a year ago and which has since been utilized it was thought the recovery of values would be so close there would be no further use for the rag plant. The Liberty Bell mill contains 80 stamps and tube-mills and has been crushing 300 tons of ore daily. The value is saved by amalgamation and concentration.

Summit County.

(Special Correspondence).—Another strike has been made in the Old Union mine, near Breckenridge. Upraises have been started above the large main tunnel to start stoping ore for the mill.——The Excelsior mine at Frisco, owned by Frank Wyborg of Cincinnati, Ohio, is making shipments of high-grade silver ore.——The Germania mine, on Little Mountain, continues to make regular shipments of silver ore from the lease operated by Engle & Kaiser.——The Sallie Barber mine, on Nigger Hill, Breckenridge, has a large quantity of zinc-lead ore awaiting shipment, but the management cannot obtain cars from the railroad.——The Jessie mine has been again leased to Thomas R. Griffith of Breckenridge.——The Lenawa Reduction & Tunnel Co. has been incorporated by James H. Myers, to operate the Lenawa property in Montezuma.

Breckenridge, Jan. 22.

The Number Three shaft on the Silver King property on Nigger hill, near Breckenridge, is being operated under a sub-lease by D. W. Dean and W. Sprague.

Teller County.

(Special Correspondence).—The Elkton mine is making its usual production from main workings and leases. The Gregory lease on the Elkton is producing 3,000 tons per month. The Tornado lease is making a fair production of 2½ to 3 oz. ore. The main workings of the Elkton are producing 1,800 tons per month. Some benefit is still being derived from the old El Paso drainage tunnel, and according to R. P. Windsor, superintendent, the water is receding about .6 ft. per week. E. M. DeLavergene, of Elkton, Colo., is manager.——Generally speaking, the mines of the Cripple Creek district are keeping up the usual output, and in some instances increasing. There is complaint throughout the district that the miners are not spending their money at home, but sending away for their supplies, and that the adjoining towns are not in a prosperous condition.——The prospects of the new drainage tunnel do not look encouraging at present, as some of the mines in the district are said to be blocking the scheme.——On Beach hill the El Paso mine, W. M. Bainbridge superintendent, is putting in a big pump. Work will commence immediately at the bottom level and ore taken out as rapidly as possible. It is thought that the pumping at the El Paso will help out the C. K. & N., which adjoins the El Paso, and which has been closed down for some time on account of the volume of water they have to contend with at the lower levels.

Cripple Creek, Jan. 20.

On Beacon hill, near Cripple Creek, the Rocky Mountain and Old Gold, after a few months of idleness, have resumed operations.——Funk, Morrison & Co., operating a lease on the Silver Tip claim of the United Gold Mines Co. on Bull hill, have completed sinking the shaft and have started north and south to drift on the vein.——A mill is to be erected by the Little Giant Mining & Milling Co. on the site of one destroyed by fire recently. Charles B. Burch is manager.——The south end of the Dexter property, at the southwest extremity of Bull hill, is being prospected by lessees.

The Lou Dillon, being operated under lease by the Dillon Leasing Co., of which John Price is president and general manager, is producing 700 tons a month. Another 100-ft. lift is being added to the shaft, which will give it a depth of 900 ft., at which point a station will be cut and drifting started.

IDAHO.

Blaine County.

The Idaho Prospecting & Development Co., Ltd., has been incorporated at Hailey, with Samuel Friend as president, to work the Merchant and Dundee gold properties.

Kootenai County.

The Gold Ridge Mining Co. at Cœur d'Alene at its annual meeting elected F. L. Bergan president and Daniel Davis manager. The property consists of four quartz claims, a water right and a millsite, six miles from St. Joe, at the head of navigation on the St. Joe river. Four men are sinking a double-compartment shaft, now down 70 ft. This shaft will be sunk 200 ft. and then crosscut the ledge. As soon as the snow will permit they will build six miles of wagon road and put in hoisting machinery.

Latah County.

On Moscow mountain, eight miles northeast of Moscow, the White Cross Mining & Milling Co. is working a double shift, driving a tunnel that when completed will cut the ledge 400 ft. below the surface. This lower tunnel is in 270 ft. It is estimated that 30 ft. more will cut the ledge. Within two months experts have recommended that the company no longer use the stamp-mill, but put in the cyanide process. Before doing this, however, the company decided to run a tunnel that would give them such depths as would give assurance that the rich ores go down. F. H. Schriber is president.

MONTANA.

Beaverhead County.

The Montana-Ajax Co., owner of the Ajax mine near Briston, will connect the mine with its 40-stamp mill by an aerial tramway in the spring. The management is drifting from the lower tunnel to test the value of the vein.

Deer Lodge County.

Proceedings have been begun against the Anaconda Mining Co. and Washoe Co. of the Amalgamated Copper Co., operating the Washoe copper smelter at Anaconda, seeking an injunction perpetually restraining the smelter from operation on the grounds that poisonous elements are evolved from the smelter through the smoke settling upon farms in the vicinity, rendering what was once a fertile stretch of country now a waste. Fred J. Bliss of Idaho, who brings the suit, represents the so-called 'smoke association,' composed of a number of ranchers in Deer Lodge valley, adjacent to the plants of the Amalgamated Co. It is alleged that $2,000,000 worth of agricultural land has been rendered unproductive through precipitation from smelter fumes. Damages are also asked for stock said to have been killed through the eating of grass upon which fine copper had been precipitated.

Madison County.

The Toledo Mining Co., which succeeded the Bismarck-Nugget Gulch Co., is prospecting its claims, near Sheridan, with a diamond drill.

The Conroy Placer Mining Co. has made a contract with the Madison River Power Co. for electric power for its new dredge.

Powell County.

Boiler and hoist have been put on the Lady Smith copper mine, 10 miles north of Elliston, and sinking of the main working shaft has been started. Vincent Smith has charge.——W. M. Price is getting out high-grade ore from his property near the Lady Smith, and Frank Wilton is developing property at the head of Deadwood gulch. The ore produced is free milling and a stamp-mill may be erected during this year.——C. F. Fredericks, who purchased the Monarch mine, near Elliston, has let a contract to Charles Anderson to run a 200-ft. tunnel drift on the Monarch vein.

Silver Bow County.

(Special Correspondence).—In 1905 Montana produced 350,000,000 lb. of copper, and of that amount the Butte district contributed 341,751,065 lb. The Butte output by months was as follows: January, 29,419,000 lb.; February, 26,089,000; March, 28,977,250; April, 26,850,000; May, 28,220,000; June, 31,290,000; July, 27,079,000; August, 28,356,940; September, 26,970,000; October, 28,517,520; November, 29,817,650; December, 30,164,705. Butte ores carry an average of 2½c. in gold and silver for each pound of copper, which added nearly $9,000,000 to the copper value, or a total value of the mineral output of the Butte district of $63,680,170.40, taking 16c. as the average for copper. The December output was as follows:

Company.	Pounds of Copper.	Tons of Ore.	Yield Per Ton in Pounds.
Boston & Montana	7,015,300	96,100	73
Anaconda	8,184,000	127,875	64
Butte & Boston	1,033,090	16,430	63
Trenton	1,153,200	18,600	62
Washoe	885,360	13,020	68
Parrot	868,000	12,400	70
Clark's Original	2,790,000	38,750	72
Pittsburg	406,720	4,960	82
North Butte	2,673,750	19,375	133
United Copper	3,454,485	50,065	69
East Butte	892,800	5,580	160
Miscellaneous	806,000	12,400	65
Total	30,164,705	415,555	...

The Butte & London Copper Mining Co., with a capital stock of $5,000,000, has been organized in Butte and incorporated under the laws of Arizona. The officers are: President, Theodore Brantly; vice-president, James H. Lynch; treasurer, Alexander J. Johnston. The company owns the Greendale placer claim, consisting of 113 acres, and lying 1,000 ft. east of the North Butte properties. Mining engineers have reported that the North Butte veins go through the Greendale. Adjoining the Greendale on the east is the Greenleaf of the Boston & Montana Co., upon which the latter is working and has cut a vein at a depth of 150 ft. —— The East Butte Mining Co. has taken the leasers out of the Yankee Boy and Dutton mines and extensive repairs are being made in both. The Dutton shaft will be made the main working shaft of the East Butte and will be sunk to a depth of 1,000 ft. Leasers will continue working the other mines of the company until the property is fully equipped with larger machinery for extensive operations. —— The Raven Mining Co. has begun shipping ore and is also running another crosscut to the veins from the 1,500-ft. station, expecting to cut the main vein in a month.

Butte, Jan. 22.

Development work at the Combination mine in Meaderville, owned and operated by the Reins Copper Co., is progressing rapidly. The shaft is down to the depth of 1,030 ft. At the 1,000-ft. level excavation was made for a pump station and a large pump has been installed, which handles all of the water in the mine. Another large pump on the 800 level is ready to use, but is held in reserve. It is the intention of the company to continue development work until the 1,200 level is reached, when a working station will be made and a crosscut run to the lead, which was found a short distance from the shaft by crosscutting on the 800 level.

NEVADA.

The tariff on ore to given points on the line of the Southern Pacific railroad is stated by the Nevada *State Journal* to be as follows: From Mound House to Keeler and points between, ore which does not exceed in value $25 per ton, the rate is $4.50 per ton; not exceeding $50 per ton, $6 charge; not exceeding $100 per ton, $10 charge. From Palisade to Keswick, San Francisco or Vallejo, not exceeding $50 per ton, $5.80; not exceeding $100 per ton, $7.80. From Battle Mountain to Keswick, San Francisco or Vallejo, not exceeding $50 per ton, $5.40; not exceeding $100 per ton, $7.20. From Sodaville to Utah smelters, not over $40 per ton, $5; over $50 per ton, $6.75; not over $60 per ton, $7; not over $70 per ton, $8; not over $80 per ton, $9; not over $90 per ton, $10; not over $100 per ton, $11.20. From Sodaville to Denver, not over $40 per ton, $8; not over $50 per ton, $9.75; not over $60 per ton, $10; not over $70 per ton, $11; not over $80 per ton, $12; not over $90 per ton, $13; not over $100 per ton, $14.20. From Eureka to Utah smelters, not over $12 per ton, $5; not over $37.25 per ton, $6.25; not over $59.49 per ton, $8.25; not over $112.12 per ton, $10.75. From Austin to Utah smelters, under $50 per ton, $7.50; under $50 per ton, $8.50; not over $100 per ton, $9.95.

Esmeralda County.

The Manhattan Dexter Mining Co. will erect a 20-stamp custom mill and cyanide plant at Manhattan. The mill has been purchased by A. D. Nash. Only 10 stamps will be put in at present.

Abner J. McDaniel, manager for the Gold Mountain Exploration Syndicate, will put in a mill on the syndicate's property at Gold Mountain.——J. H. Humphrey, of the Nevada-Goldfield property on Gold mountain, reports that the main working double-compartment shaft is down 100 ft., but crosscutting will not be commenced until the 300-ft. level has been reached. The hoist is of sufficient capacity for 800 ft.——The Flying Dutchman mine, near Aurora, has been sold by Al Wild to Eastern parties for $60,000. The new owners will build a large hoist and make improvements. —— Lumber and other materials are being hauled to the Diamondfield-Triangle property at Diamondfield and a new 12-h.p. gasoline hoist will be put in place.

Lincoln County.

(Special Correspondence).— President Hansen states that the Searchlight & Northern will push the construction of their new railroad through Searchlight on to Eldorado canyon, regardless of what the Santa Fe intends to do. The Searchlight & Northern will be a narrow gauge, connecting with the Los Angeles, San Pedro & Salt Lake Railroad at Nipton. The Santa Fe, which has its surveying party in the field, will make its connection at Golfs, on the main line, and will build a broad-gauge road, thus giving Searchlight two railroads by next July.——The Pompeii Mining Co. has installed its large pump, which will handle 60,000 gallons of water per day. This company will furnish the Searchlight & Northern Railroad with 40,000 gallons of water per day. ——The Searchlight Consolidated has completed the construction of the buildings it requires, and has started a large force to work. This company has some excellent ore at the grass roots and the development of their ground with a 500-ft. shaft will be watched with interest.——A quarter of a million dollar deal was made when McGhan & McLaughlin sold their claims to Geo. P. Spittall and Philadelphia associates and Los Angeles capitalists.——A rich strike was lately made on the Cyrus Noble mine. The mill on this property will soon be completed.——The Goodenough mine has a new hoist on the ground, and will develop the rich ledge of free gold at their 100-ft. level. This ledge is the west extension of the Duplex mine, and the east extension of the Cyrus Noble mine.——The Quartette mine is nearing the 1,000-ft. level. Two upraises were driven from the eighth level, both being in rich ore. This company has brought most of its 20-stamp mill from the river, and will soon have forty stamps in operation at the mine.——The Santa Fe mine will start sinking for the 500-ft. level. A 25-h. p. hoist and a 40,000-gal. Cornish pump have been installed recently, as well as a 1000-lb. skip, and active operations will now go forward. ——Within three weeks stamps will be falling in the new 10-stamp mill of the Searchlight Mining & Milling Co. There are nearly 2,000 tons of broken ore now ready to go into the hoppers, as soon as the mill is ready for operation. This mine has been shut down for a short time, on account of inability to economically handle the ore already broken, but work will now be resumed in the mine at once.——The Black Hawk mine, owned by the LeRoy Mining & Milling Co., has had a gallows frame erected in the record-breaking time of three days. It is equipped with a 15-h. p. hoist. The shaft is down 250 ft., and active operations are going steadily forward.

Searchlight, Jan. 20.

Geo. E. Otis and associates, owning the Gladiator

group at Eldorado Canyon. will prospect by diamond drilling.——Geo. W. Seay, of Searchlight, has sold out his interest in the Harris turquoise mines at Crescent to Wm. F. Fonda and Peploe Forwood, of San Francisco. It is stated that the owners will run a long tunnel to open the lead at great depth, to facilitate which an air-compressor plant and machine drills will be put in.

The Duplex and Good Hope claims at Searchlight have been sold to George Brockman and associates.

A working shaft is to be sunk on the Sibert ledge, near Caliente, to connect with the tunnel being driven with three shifts. It is reported that C. B. Sibert intends to put up a 50-stamp mill.——Duncan & Burke, of Pueblo, Colo., have purchased a half interest in the Snowslide claims, northwest of Caliente, and will sink a double-compartment shaft on the Black Bird, on a ledge of high-grade silver-lead ore.

The Hidden Treasure gold mines on Virgin river, south of Caliente, have been sold to W. T. Miles, of Chicago, who intends to put in a mill and develop the property.——Bismuth is reported to have been struck three miles from Caliente.

Nye County.

The Nevada Copper Co. has been organized to operate the Dunlap copper mine in the Pilot range, 18 miles northeast of Sodaville and 65 miles north of Tonopah. The Tonopah Mining Co. is said to have the control. A new tunnel will be driven 2,800 ft. to tap the sulphide ore zone, 400 ft. deeper than the present workings. A concentrating mill of a daily capacity of 100 tons will be installed immediately and the concentrates shipped to Salt Lake smelters.

A diamond drilling plant has been ordered from Chicago by the Anchor Gold Mining Co., of which E. R. Argersinger, of Tonopah, is the local manager. It is intended to use the drill on the company's Silver Pick lease, as well as on several other leases in which it is interested.

NEW MEXICO.

Colfax County.

Power drills are being installed by the Gold & Copper Deep Tunnel Mining & Milling Co., at Baldy, where 1,800 ft. of development work has already been done.

Dona Ana County.

The Dona Ana Mining Co. is putting in a 150-ton concentrator at its mine, near Organ.——The Stephenson-Bennett property has passed into the control of Missouri capitalists, who are sinking a double-compartment shaft to a depth of 500 ft.——The Modoc Mining Co. has placed an order for a new mill, the former dry concentrating plant having proved unsuccessful.

Grant County.

A pump has been ordered for the Cobra Negra mine, near Lordsburg. The North American Co., owner of the mine, will continue sinking on the main shaft. F. A. Lister is at the mine.——The Burro Mountain Copper Co. has acquired the Irish Gray group, the Stella, the Nighthawk and the I. C. claims at Leopold.——A. W. Humpe and associates of Grand Rapids, Mich., have leased from the International Gold Mining & Milling Co. the Gold Brick claims in the Malone district. They will complete the mill now under construction.

Sierra County.

The Sierra Consolidated Gold Mining Co., which owns the Snake mine, east of Hillsboro, is behind a project to build a trolley line from Deming to Hillsboro.

OREGON.

Grant County.

The Steuben Placer Mining Co., which recently acquired the Thornburg placers on the North Fork, has installed an electric lighting plant and is preparing to operate the mines next season.

R. C. Reese, superintendent of the Dixie Meadows mine, near Prairie City, will leave for Denver shortly to purchase machinery which the management has decided to instal. This will be placed by February 15, if possible. The work of sinking 3,000 ft. will require about four months, after which time a new stamp mill will be put in. A new sinking plant and air compressors are now being installed.

Jackson County.

It is reported that the Blue Ledge copper mine on Elliott creek, in the Siskiyou range, on the California-Oregon line, has been sold to Robert S. Towne, of New York. F. W. Carnahan has been appointed superintendent. The new owners may build a railroad 30 miles long to Medford.

SOUTH DAKOTA.

Lawrence County.

The Clover Leaf Mining Co. is preparing to drain the mine and resume operations. The company owns 57 claims at Roubaix and has a 60-stamp mill. Since the flooding of the mine last June the property has been idle, but the average flow of surface and other water into the mine is about 620 gal. per minute. The pumps can handle this as soon as the mine is drained out, as the flooding resulted from an accident. The company will also sink a new shaft, which it will connect with the old one by means of a tunnel.——Edward Major of Central City has taken a lease on the Esmeralda property and also on the Columbus mill, at the mouth of Blacktail gulch.

Chas. A. Allen, manager of the Lucky Star Co., operating on Box Elder creek, south of the Clover Leaf, reports the shaft 100 ft. deep and crosscutting under way. Work is to be continued through the winter.

Pennington County.

All the machinery for the new Clara Belle mill, near Hill City, has arrived and is expected to be placed by March 1. The shaft is down 250 ft.——Ten men are employed at the Gertie mine at Hill City in repairing and preparing the mill for a test run. A 1-stamp mill is to be used on the preliminary tests.

UTAH.

Iron County.

James Canfield of the Bull Valley iron mines states that work has been discontinued at the mines for the present, owing to the weather.

Juab County.

Supt. C. W. Jones, of the Bonanza mine in West Tintic, near Eureka, states that he is trying to induce the company to put up a mill for the treatment of the low-grade ores of that region.——At a meeting of the board of directors of the Sweetwater Mining Co. it was decided to continue the work on the North Tintic property indefinitely. A shafthouse has been erected, a whim put in, and a wagon road is being built to the claims.——The Scranton mine in West Tintic will soon be shipping a carload of ore a day. The ore-house on the San Pedro railroad is finished.——The output from the mines of Tintic has increased so rapidly in the past few weeks that the Rio Grande Western railway has found it necessary to put on an extra switch engine and crew to handle the ore cars. The present output of the mines has never been equalled in their history.——The ore shipments from Eureka for the week ending January 20 amounted to 167 carloads, produced by the following properties: Scranton, 1; Ridge & Valley, 5; Centennial-Eureka, 51; Bullion-Beck, 7; Dragon Iron mine, 18; Gemini, 17; May Day, 1; Yankee Consolidated, 4; Beck Tunnel, 2; Eureka Hill (lease), 3; Brooklyn Consolidated, 1; Swansea, 4; South Swansea, 1; Eagle & Blue Bell, 5; Uncle Sam Consolidated, 2; Ajax, 4; Black Jack, 7; Carisa, 6; Grand Central, 10; Lower Mammoth, 1; Victoria, 5; Victor, 1.

Piute County.

The Annie Laurie Mining Co.'s mill, at Kimberly, has been closed down and it will not be in operation again until March 1. The crushing, rolling, firing and cyanide departments are to be overhauled. G. A. Baird has been elected president of the company.

Summit County.

A 500-ton ore-bin has been completed at the Little Bell mine at Park City, and Superintendent Newton Dunyon intends to begin shipping ore soon.

Washington County.

S. L. Adams and associates have sold a controlling interest in the Paymaster copper mine, near St. George, to Samuel Newhouse, Joseph T. Jenkins and F. A. Schirmer. Mr. Adams still retains a third interest and will be placed in charge. It is the intention of the new management to sink the shaft deeper.

WASHINGTON.

Ferry County.

The Oversight Mining & Milling Co., operating 10 claims on Belcher mountain, near Republic, has built an engine house and a four-drill compressor plant. A tunnel is being driven along the foot-wall of the Oversight vein. Manager E. J. Delbridge is arranging to ship ore to the Granby smelter.

The Pearl Consolidated Mining Co. of Republic has purchased the air compressor and water drills formerly at the Princess Maud tunnel. William M. Crummer is superintendent and is pushing work at the Lone Pine.——A crosscut from the tunnel on the 300-ft. level of the Copper Key mine near Republic is being pushed ahead to tap another vein.

Okanogan County.

(Special Correspondence).—At the Triune mine, at Golden, the lower tunnel has crossed the third vein. It is two feet wide and produces some of the best ore that has ever been found in the mine.——At the Copper World Extension mine, the south crosscut on the 200-ft. level had cut a wide vein of iron sulphide which gives good value in copper.——Work is to be started on the Bodie mine, at Bodie camp, under the new management. A contract has been let to drive 100 ft. on the vein on the 300-ft. level. The Bodie mine lies near the Ferry county west line and is tributary to Republic.——The Phil Sheridan mine, at Sheridan, is being worked by the Phil Sheridan Mining & Milling Co., of which William A. Potter of New York and Peoria, Ill., is president. The mines are 14 miles northwest of Republic, near the head of Toroda creek. The nearest railway station is Lynch's, on the Victoria, Vancouver & Eastern line, over which the ore may be shipped to the British Columbia or coast smelters. The Phil Sheridan vein has been opened by a shaft 100 ft. on the dip of the vein. A tunnel 220 ft. long crosses it at that depth. The high-grade ore is being shipped and the low grade will be held for concentration. The company has located a water right and millsite on the east branch of Toroda creek. The ore can be hauled and transported by wagon and railway to the smelter and treated, at a cost of $12.50 per ton.——High-grade silver ore has been found on the lower tunnel level of the Ruby mine, at Nighthawk, 300 ft. lower than the No. 2 tunnel workings.

Republic, Jan. 19.

The Judge Mining Co. has acquired the Leadville group on Palmer mountain, four miles from Loomis. O. W. Irwin, of Dayton, Ohio, is president.

The Prize mine, on Mount Elemeham, near Nighthawk, has been sending out small lots of shipping ore to the smelters.

Pierce County.

From the plant of the Tacoma Smelting Co. a carload of copper-wire bars is being shipped each day to the Atlantic coast, to be loaded on steamers bound for Germany, where the bars are drawn into wire. The smelter has, for the present, discontinued the moulding of the small copper ingots. The addition to the refinery is under cover and the new reverberatory furnace is being installed.

FOREIGN.

AFRICA.

Rand.

A scheme is under consideration at Johannesburg for the installation of an electric generating station at Vereeniging, capable of developing 100,000 h. p., for supplying the needs of the Witwatersrand. Vereeniging is 32 miles from the Rand, and it is intended to utilize coal-fields in the Vereeniging district, where a plentiful supply of water is also available.

CANADA.

BRITISH COLUMBIA.

Boundary District.

The output of the Boundary mines for the week ended Jan. 20 was: Granby mines to Granby smelter, 16,708 tons; Mother Lode to B. C. Copper smelter, 3,424; Brooklyn Stemwinder to Dominion Copper smelter, 2,790; Rawhide to Dominion Copper smelter, 420; Sunset to Dominion Copper smelter, 1,716; Emma to Nelson and B. C. Copper smelters, 363; Oro Denoro to Granby smelter, 510; Providence to Trail smelter, 40. Total shipments for week, 25,971 tons; total for year, 54,476 tons. Boundary smelters treated as follows: Granby smelter, 17,020 tons; B. C. Copper Co. smelter, 3,653; Dominion Copper Co. smelter, 4,297. Total for week, 26,000 tons; total for year to date, 58,172 tons.

Cariboo District.

The Bear Hydraulic Mining Co. is getting out lumber for a bedrock flume. The mine is on the south side of Cunningham creek.——At La Fontaine, on Lightning creek, the Cariboo Consolidated, Ltd., has been drifting to bedrock in the channel of the creek. It took two years to complete the company's plant, and is said to be handling ground that runs five ounces in gold to the set of timbers, each set being four feet wide and four feet long.——The Cariboo Goldfields Co., Ltd., has resumed operations after being shut down several months. This company is on Williams creek. F. C. Laird has charge. In this territory, in the Barkerville neighborhood, 150 white men and from 300 to 400 Chinamen are working. Ten companies are in the field.

East Kootenay District.

D. C. Corbin of Spokane and his associates have purchased 17 square miles of coal lands in the Crow's Nest district, 18 miles east of Fernie. The property was bought from Al Page of Wardner, Idaho, and the Langley Bros. of Cranbrook, B. C. Development has exposed a vein 80 ft. in thickness. This has been stripped on the surface for 1,200 feet.

Rossland District.

All of the details having been completed for the amalgamation of the Center Star and War Eagle companies at Rossland, the two are welded into one corporation, the Center Star purchasing the assets of the War Eagle. The ground of the two companies, together with their machinery, will hereafter be operated by the Center Star Consolidated Mining Co.——Work has been resumed at the Mabel, near Rossland. —— The ore shipments for the week ended Jan. 20 were: Center Star, 4,080 tons; Le Roi No. 1, 2,040; Le Roi No. 2, 570; Jumbo, 300. Total, 6,990 tons, and for the year, 19,210 tons.

Slocan District.

W. E. Zwickey, of Kaslo, manager of the Rambler-Cariboo mines, in McGuigan basin, reports that the crosscut tunnels being run to the vein at the 1,400-ft. level has been run 3,700 ft. of the estimated 4,500 ft. before a raise is to be made with the shaft. This tunnel will lessen the cost of pumping and hoisting. The portal is on Dardanelles creek, half way between McGuigan station and the mine. It was started on July 9, 1904.

KOREA.

The report by the Commercial Bureau of the Japanese Foreign Office on Mines and Mining in Korea shows that the mineral output of Korea consists entirely of gold, which is recovered by placer or quartz mining. The number of places where gold is at present worked, either by placer or quartz mining methods, amounts to 120. The amount produced annually is about 121,000 oz., of a value of $2,250,000. Quartz gold appears most plentiful in Pyeng-An province, the Wonsan mine being the most valuable in the country. The next in importance is the Eun-san mine. Other valuable mines are Chang-song and Tel-chon. Placer gold occupies the principal place in the products of the peninsula, and the mining districts are more widely distributed than those of the quartz mines. Of the total gold output, the proportion of placer gold amounts to $1,500,000. The principal centers of placer mining are situated in Pyeng-An province, the whole annual output of this province being 48,000 oz., of a value of $750,000. In spite of the demand for silver in Korea there is no native supply. There are, however, silver mines in the country. Experimental workings have been made, and it appears that there are undoubtedly silver deposits. Owing to the expense of working, however, they offer far more difficulty in working profitably than gold mines, and especially than placer gold. Copper occurs chiefly in the north and south of the peninsula, and is rarely found in the central districts. The principal mine in the country is that of Kap-san, in Ham-Gyeng province, which has a considerable output, amounting to 270,000 lb. of refined copper per annum. Iron is found in Whang-Hai and other provinces, but the difficulty and expense of mining and smelting have hitherto precluded the Koreans from engaging to any great extent in this industry. The future of the coal mining industry in Korea does not look promising; there are, however, coal deposits in several places. Of these deposits only that at Pyeng-Yang consists of smokeless coal, all the others being bituminous, and though some of the deposits are of considerable extent, the quality is not very good. Crystal is a famous product of Korea. It is found principally in Kyeng-ju, in North Kyeng-Sang province, and is of excellent quality. Talc of excellent quality is found at Pyeng-hai, in Kang-Won province, and in the neighborhood of Yee-Chun, in Kyeng-Kei province, but it does not appear ever to have been worked.

MEXICO.

Chihuahua.

The dismantling of the San Felipe smelter on the north side of the Chuviscar river has been started. The material of this plant is to be utilized in the new Chihuahua plant as far as possible. W. W. Morse is in charge of construction work at the new smelter.

At the Los Angeles gold mines, 75 miles southwest of Sandia, the foundations for the new 10-stamp mill are nearly completed.

Coahuila.

The Continental Mining Co. has obtained a concession from the Legislature to establish smelting works near Monclova.

Durango.

Alexander Baring and associates have purchased the Guadalupe mine, near Inde, and will put in a 100-ton mill and cyanide plant, also a five-mile pipe-line. F. P. Sherwood made the deal.

The Mexico Consolidated Mining & Smelting Co. at Guanacevi has started stoping. Hitherto the company has been using only such ores as came from development work. The mill continues to run smoothly.

Construction work is to be commenced by the Parral Power & Reduction Co., which has taken over the concessions held by Eugene Davis of Washington upon a 5,005-h.p. electric plant in the State of Durango, 51 miles from Parral, which will furnish electric power to Parral, Santa Barbara, Inde and Guanacevi, and for a 1,100-ton reduction plant at Parral.

Mexico.

The efficiency of the 100-stamp mill and the cyanide plant recently installed at El Oro, on the mining property of the El Oro Mining & Railway Co., is said to have exceeded the original estimates and the new plant alone is handling the entire output of 15,000 tons a month, without using the old 100-stamp mill.

Sinaloa.

The Compania Minera Guadalupe de los Reyes, which owns six mines in the Cosala district, is preparing to reduce the cost of operating its mines and reduction works by installing a hydro-electric plant at the falls of the Piaxtla river. The plant will have a capacity of 5,000 h.p. Robert McF. Doble recently prepared plans for this plant.

The Oro Fino Mining Co., which recently acquired an old mine in the Rosario district, has started to develop the property by means of a tunnel. An air compressor and rock-drills have been put in and the plans of the company include a 10-stamp mill. At present the mine is reached by a mule-back trip of 30 miles from Rosario. The Guaymas-Guadalajara extension of the Southern Pacific will pass within eight miles. J. W. A. Off, C. F. Whittier, Isaac Bryson and C. Butterfield, of Los Angeles, are interested.

Sonora.

The Monte Visto Mining Co., operating near Cos, is to put a 20-stamp mill on the property, with extra power, so that other stamps may be added.

The Trinity Mining Co., which bought from M. Latz the Jojuba mine, nine miles west of Magdalena, is to add a cyanide plant to the mill.

The Giroux Consolidated Mining Co. are receiving machinery to put up a reduction plant at Capote, for reduction of low-grade ore from their Sultana property.

Books Received.

'Geology of the Boulder District, Colorad o,' by N. M Fenneman, Bulletin No. 265 of the United States Geological Survey. The greater part is taken up with a discussion of the physiography and stratigraphy of the region. Under the head of economic geology, oil and gas occurrence in the Pierre sandstone is described in detail.

'Report of the Bureau of Mines of Ontario, 1905.' Part I comprises a statistical review for 1904, an account of summer mining classes, mines of Ontario, petroleum and natural gas, cement industry, explorations in Arbitibi, Loon Lake iron-bearing district, Boston township iron range, pre-Cambrian nomenclature and the iron ranges of Michipicoten West.

The United States Geological Survey has issued two folios dealing with the geology of the Black Hills and of the Great Plains province, Sundance No. 127 and Aladdin No. 128. The former comprises the southeast corner of Crook county, and the northeast corner of Weston county, Wyoming, and also a narrow area of Pennington and Lawrence counties, South Dakota. The latter comprises the northeast corner of Crook county, Wyoming, a narrow strip of Butte county, South Dakota, and the extreme northwest corner of Lawrence county, South Dakota, on the east, and a little of Custer county, Montana, on the west.

Commercial Paragraphs.

H. C. LEE, Los Angeles, manager for Harron, Rickard & McCone, was in San Francisco this week.

THE Pelton Water Wheel Co. have sold their present plant and will build larger and better equipped works at 19th & Harrison Sts., San Francisco.

THE Robins Conveying Belt Co. has recently opened an office in the Frick Bdg., Pittsburg, Pa., with G. R. Delamater as resident engineer, who is prepared to receive inquiries relating to conveying and hoisting machinery.

THE Sullivan Machinery Co., of Chicago, reports the appointment of H. T. Walsh, as manager for the Pacific Coast, with headquarters with the firm of Henshaw, Bulkley & Co., who have been, for a long time, the agents of the Sullivan Machinery Co., and will continue to carry a stock of Sullivan rock drills and compressors.

THE Angels Iron Works of Angels, Cal., report new orders for their battery stem guide as follows: Melones mine equipment for 60 stamps; Lightner for 40; Angels and App mines, each for 40; Alto and Clary mines, each for 10 stamps.

Personal.

F. L. BOSQUI has returned from Mexico.

O. P. POSEY, of Los Angeles, is at the Palace.

JOHN OVERBURY of Bullfrog, Nevada, is in San Francisco.

NOEL G. HACKNEY is on his way from London to Brazil.

ROBERT T. HILL has returned to New York from Mexico.

L. L. PATRICK has returned to Goldfield from San Francisco.

J. S. COLBATH, formerly of Nelson, B. C., is in San Francisco.

W. W. BLOCKLEY is at Fairplay, Colo., from San Francisco.

CHARLES J. MOORE, of Denver, is expected at Goldfield, Nevada.

F. B. CALDWELL of San Dimas, Mexico, is at the St. Francis Hotel.

EDGAR NEWHOUSE of New York City is at the St. Francis Hotel.

CHARLES MOLSON has returned to Salt Lake City from New York.

ALBERT BURCH is inspecting mines in the Tonopah region of Nevada.

HENRY C. CALLAHAN sailed on the *Sierra* for Queensland on January 26.

GEO. R. SMITH has been elected president of the Canadian Mining Institute.

FRANK STRAUB and E. W. SEBBEN, of Denver, are examining mines in Arizona.

DOVETON & PURINGTON have moved their Denver office to the McPhee Building.

H. H. LEE passed through San Francisco on his way from Denver to Chihuahua, Mexico.

P. O. WELLS has been appointed superintendent of the International Ore Treating Company.

H. P. BUCKINGHAM, lately with Le Roi No. 2 mine at Rossland, B. C., is visiting San Francisco.

EDMUND JUESSEN, of Spokane, has opened a branch office in the Schmiedell Bdg., San Francisco.

WALTER M. BRODIE has returned to Chihuahua from a mining inspection in the Sierra Madre, Mexico.

FRANK R. CARPENTER, of Denver, has gone to northern Mexico, whence he will proceed to Lower California.

E. H. HOFFMAN, superintendent of the Carisa mine, has been made superintendent of the Silver Shield mine at Bingham, Utah.

EDWIN H. DAVISON has gone to the Amalie district, in Kern county, California, and will be absent from Fruitvale two weeks.

J. B. TYRRELL has changed his address for the winter from Dawson, Y. T., Canada, to 266 McLaren street, Ottawa, Canada.

C. A. HEAGLER, president Babispe Mining & Milling Co., has returned to Los Angeles from the Moctezuma district, Sonora, Mexico.

DUNCAN MCVICHIE of Salt Lake City is superintending the construction of the new smelter at the Balaklala mines, Shasta county, California.

W. J. ATKINSON, superintendent of mines for the Arizona Copper Co., at Longfellow, Ariz., has resigned and will go to Winnipeg, Canada.

F. H. MITCHEL has resigned as metallurgist Helvetia Copper Co. to become assistant superintendent Black Diamond Copper Co. at Black Diamond, Arizona.

JOHN E. STRACHAN has severed his connection with Bewick, Moreing & Co. in Western Australia to join the San Francisco office of the Midvale Steel Co. of Philadelphia.

LOUIS W. POWELL, assistant general manager of the Oliver Iron Mining Co., has resigned to become general superintendent of all the Bonanza Circle copper mines at Bisbee, Arizona.

EDWARD BRUSH has tendered his resignation as secretary of the American Smelting & Refining Co. The vacancy was filled by the election of W. E. MERRISS, who has been assistant secretary of the company for the past four years. G. M. BORDEN was elected assistant secretary.

Obituary.

GEO. TYNG, lessee of the Wyoming mine, in American Fork canyon, Utah, was killed by a snowslide at the mine January 19.

JOSEPH HEWLETT, formerly an engineer in the Comstock mines and for some time superintendent of the Gould & Curry mine, died at Stockton, Cal., on January 21, at the age of 77.

Trade Treatises.

Bulletin No. 62 of the Crocker-Wheeler Co., of Ampere, N. J., pictures electric hoisting machinery.

Westinghouse Electric & Manufacturing Co. of Pittsburg, Pa., describe Type C transformers in Circular No. 1126.

'Roofing Rules' has been received from Merchant & Evans Co., Philadelphia, Pa. This neat booklet is designed as a hand-book on sheet metals in building construction for architects, owners, engineers and builders.

'Tremain Steam Stamp,' Bulletin No. 1408, from Allis-Chalmers Co., Milwaukee, Wis., besides showing the construction of the stamp, contains an admirable treatise on milling and concentration tests. Bulletin 1704, from the same company, illustrates and describes lath mills and bolters.

Latest Market Reports.

SAN FRANCISCO, January 25, 1906.

ANGLO-AMERICAN SHARES.

London, January 25, 1906.

	£ s d		£ s d
Camp Bird	1 11 0	Oroville	0 18 9
El Oro	1 7 10½	Stratton's Independence	0 8 6
Esperanza (ex div.)	4 18 9	Tomboy	1 5 6
Dolores	2 1 3		

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. January 25, 1906.)

Amalgamated	$110⅝	North Butte	$ 86¼
Anaconda	271	Old Dominion	39
Bingham Copper	33¼	Shannon	6¾
Daly West	16¼	Tennessee Copper	47
Granby	9¼	Tonopah-Nevada	18¼
Greene Consolidated	28	United States	60¼
Nevada Con. Copper	11¼	Utah Copper	38

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 25	Ophir	$6 00
Hale & Norcross	0 93	Potosi	0 04
Mexican	1 20	Savage	0 43
Exchequer	0 32	Yellow Jacket	0 08

[Tonopah and Goldfield.]

Belmont	$2 92½	Montana-Tonopah	$2 85
Golden Anchor	1 25	Ohio-Tonopah	0 41
Jim Butler	0 91	Red Top	2 00
Jumbo	1 40	Sandstorm	1 57½
Kendall	0 77	Tonopah Ex	0 07
Midway	1 80	West End	1 70

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: London, 30 3/16d (standard ounce, 925 fine); New York, (by wire), bar silver, 65½c, per fine ounce; San Francisco, 65½c; Mexican dollars, 51@53c, San Francisco; 50½c, New York.

COPPER.—New York (by wire, average for week ending Jan. 25), Lake, 18@18.25c; Electrolytic, 18@18.12c; Casting, 17.75@18.87c per pound. Mill copper plates, $21.00; bars, 21@24c. London: £78 10s 0d spot per ton.

LEAD.—New York (by wire, average for week ending Jan. 25), $5.60 per 100 lb; San Francisco, pig, 6.55@6.78c per lb; pipe 8@8½c; sheet, 9@9½c; London: £16 18s 9d ℔ long ton.

SPELTER.—New York (by wire, average for week ending Jan. 25), $6.45 ℔ 100 lb; London, £27 6s 6d ℔ ton; San Francisco, ton lots, 7c: 100-lb lots, 7¾c.

TIN.—New York, pig, $36.77½@37; bar tin, ℔ lb., 42½c.; pig, 38c. London, £165 15s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $37.50@39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 33@37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR WEEK ENDING JANUARY 9, 1906.

809,895.—FAUCET—Joseph O Beazley, Baltimore, Md.

809,549.—WIRE FENCE LOCK—Gottlob W Beyerle, San Diego, Cal.

809,550.—MAKING BORIC ACID, ETC.—Henry Blumenberg, Jr., Daggett, Cal.

809,903.—DREDGER SLEEVE—William F. Bowers, San Francisco.

809,552.—WOODWORKING MACHINE—John Buffelen, Tacoma, Wash.

809,607.—TEA-STRAINER HOLDER—Abraham Chundelah, San Francisco.

809,429.—RECORDING ICE SCALE—Charles E. Crane, Seattle, Wash.

809,434.—RAIL-JOINT CHAIR—Aurelius M. Ewing, Seattle, Wash.

809,676.—SICKLE—Pearl E. Fletcher, Ridge, Or.

809,293.—GAME APPARATUS—Albert Friedenthal, Oakland, Cal.

809,614.—INTERNAL COMBUSTION ENGINE—Henry C. Holloway, Gilroy, Cal.

809,617.—VENTILATOR FOR BASEMENTS AND THE LIKE—Peter H. Jackson, San Francisco.

809,692.—PENHOLDER—Ole Johnson, Cedarhome, Wash.

809,694.—BEET HARVESTER—Charles L. Jolly, Salinas, Cal.

809,870.—UNDERREAMER—Frederick W. Jones, Santa Paula, Cal.

809,383.—CLEANSING MANUFACTURED GASES—Leon P. Lowe, San Francisco.

809,580.—FLOOR POLISHING MACHINE—Frank B. Reichenbach, Los Angeles, Cal.

809,529.—ELECTRIC LAUNDRY IRON—Earl H. Richardson, Ontario, Cal.

809,632.—ANCHOR EMERGENCY AIR-BRAKE—Charles Z. Sanders, Sacramento, Cal.

809,542.—OIL TANK INDICATOR—William Torst, Jr., San Pedro, Cal.

809,548.—PRUE CONCENTRATOR—Louis R. Tulloch, Angels Camp, Cal.

809,649.—AUTOMATIC ATTACHMENT FOR CARBONATING APPARATUS—Henry W. Van der Vaart, San Francisco.

809,593.—REMOVING MINING DEBRIS—Simon W. Wible, Bakersfield, Cal.

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SAN FRANCISCO, FEBRUARY 3, 1906.

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EDITORIAL.

IT will be noted that our list of 'special contributors' has been increased by the addition of Mr. L. S. Austin, professor of metallurgy in the Michigan College of Mines, and Mr. F. L. Bosqui, metallurgical engineer and cyanide specialist. These gentlemen need no introduction to the mining community.

FAITH in dredging for gold in California has been demonstrated this week by the purchase, on the part of Mr. W. P. Hammon and associates, of the ground controlled by the Feather River Exploration Company and the Cherokee Dredging Company, a consolidation owning 975 acres at Oroville. The capital ($1,500,000) for the new company was subscribed in San Francisco.

WE learn that a bill has been introduced before Congress by Mr. F. E. Brooks, representative from Colorado, dealing with the establishment of a Department of Mines subordinate to that of Commerce and Labor. It is provided that the Geological Survey shall be attached to this department, after being relieved of its reclamation and forestry divisions. This anticipates the suggestions offered in these columns on January 13. We hope Mr. Brooks will succeed in securing congressional action upon a matter so important to the mining industry.

WHILE Salton Sea is a serious menace to the permanent way of the Southern Pacific Railway, it is an interesting subject of study to geologists. The waters are but returning to their own after many days, geologically speaking, for it is a fact that the Colorado river formerly flowed through this depressed area, forming a fresh-water lake which must have gladdened the heart of the desert. As the region became increasingly arid, this lake dried up, dwindling to a salt marsh, the bottom of which was 300 feet below sea-level. In the effort to drain this marsh, a ditch was cut to the Colorado river. But Nature has claimed her own, the river rose in flood and has broken through the barrier so as to cover not only the marsh but a tract 40 to 50 miles wide. Officers of the Geological Survey will shortly prepare a careful map of the region, so that it may be determined exactly what is best to be done. In the meanwhile, we may conjecture what will be the effect of introducing a large body of water into the midst of this arid region; if the river retreats, the existing lake will dry up and become again a small body of salt water; if, however, the Colorado can hold its own, this part of the United States may undergo climatic conditions of a character favorable alike to human habitation and cultivation.

Gold Dredging.

The comprehensive glance at the present state of the dredging industry, which we published in our last issue, will have interested many of our readers. Few men have such acquaintance with gold mining regions as the author of 'The Gold Mines of the World', and therefore Mr. Curle's letter commands respect. It was a useful communication, for not only did the writer of it give information, but he fulfilled the equally useful function of inciting donations of knowledge from others. Certainly the knowledge available on gold dredging is amorphous and incomplete; the only published book upon it is rubbish, because it was compiled by a man of no special experience. The best publication on the subject is the bulletin issued last year by our State Mining Bureau. Most of the articles heretofore written have been too vague, too little anchored to facts and figures; a few practical contributions emerge out of this mass of hazy literature and these have been prepared, almost without exception, by Western engineers. But there is much to be done before the gaps in our information on this important branch of mining are filled. Mr. Curle specifies the several points concerning which we need facts and figures, and we are confident that among our readers there are men able and willing to contribute what is wanted. Already we are enabled to publish a special article on the testing of dredging ground, with a workmanlike description of the methods to be used in checking such results. To the younger men especially, we commend this contribution, by Mr. Norman C. Stines, as an excellent bit of technical writing; it is no pretentious essay or generalized rumination, but a straightforward record of actual practice told in terms readily understood, and calculated to have immediate practical application. If we could get half a dozen such articles on gold dredging, technical literature would be sensibly enriched.

As to prospecting ground with drills, it is said that the Oroville experience has shown a yield by dredging from 70 to 85 per cent of that given by drilling tests. It is just such statements as this that are useless, although apparently businesslike. The value of a series of drill-holes as indicating the richness of a tract of gravel cannot be gauged by any empirical formula. It is as absurd as the practice of timid engineers who cut their estimates of ore in two or deduct a certain fixed percentage from their calculations, so as to be safe. In the case of drilling before dredging, the result is reliable according to the number of holes, the distribution of them, the care taken in the work and, above everything, the personal factor. Such work carefully done and checked at each stage by a man of experience and integrity needs no big discounting, while that accomplished by an unreliable driller or a careless novice is worse than worthless. No fixed percentage covers the varying conditions surrounding an engineering operation.

In the early days of dredging it was the custom to test 200 acres with 10 drill-holes; nowadays one hole to two acres is not uncommon. When results indicate that the gravel is of varying depth, that there are irregular channels or that the ground is spotty, it is not unusual to put down as many as one to three holes per acre, especially where no adjoining workings exist, such as throw light on any anomalous results from the drilling. The cost is a limiting factor, for each hole costs $60 to $100 in ground of any considerable depth.

It is generally assumed that the results given by shaft-sinking are more reliable than those from drill-holes; as a rule this is true, but the comparison too often smacks of the old idea that a mill-run is more trustworthy than the sampling of ore in a mine. It depends upon how it is done, with this proviso, that the more men needed to carry out an operation of sampling, the greater the opportunity for error, intentional or unintentional. A shaft gives better opportunity for examining the nature of the successive layers of gravel and other conditions that bear upon the subsequent working of the ground. Careful measurements are imperative; sometimes it is not practicable to hold the same diameter of shaft all the way down, and in running ground one has to resort to timbering; these factors affect the cross-sectional area and must be carefully noted in any calculations. Moreover, instances are known where shaft results have been seriously vitiated by the fact that the particles of gold have fallen to the bottom, with the water, so that the upper layers of gravel appeared worthless, while that immediately above bedrock was excessively enriched. Great caution, bred of experience, is required to make an accurate test.

A Suggestive Discovery.

One of the most important developments made at Bendigo, the deep-mining district of Australia, is the discovery of another saddle-reef at 2,200 feet in the Catherine Reef United mine. In places, the stoping width is 50 feet. The gold-bearing formation is intersected by a lava dike, the western side of the lode being solid quartz, while on the other, or eastern, side of the dike there is a series of spurs, making away from the lava. The spurs constitute the richest ore, although the solid quartz is good enough to stope. From the first discovery of this orebody it has been noticed that the quartz associated with the lava has been best. A recent return gave 337 ounces from 260 tons. Apart from affording encouragement to those working this lode, known geologically as the Garden Gully anticlinal axis, the distribution of the gold in proximity to the lava gives valuable evidence concerning the enriching effect of the dike which forms the youngest feature in the structural geology of the district. It is apparent that the dike followed and filled a fracture which reached the surface, through the slate-sandstone country and through the saddle-reefs already formed; that this intrusion coincided with, and was followed

by, thermal activity, producing further deposition of quartz and precipitation of gold. The formation of the later gold-bearing quartz was facilitated by passageways identified with the dike and subsequently also by the shrinking of the lava when it cooled.

Mining and Geology.

The discussion growing out of the letter on 'Mining Engineers and Geologists,' which appeared in our issue of January 6, has developed usefully. Such frank give-and-take of opinion makes for a better understanding between professional men and creates a clearer idea of the value to be attached to specialized knowledge. This week the discussion is rounded by two practical contributions, one by a mining geologist who has proved the usefulness of applied science and the other by a successful mine operator who knows how the commercial purpose of mining can be furthered by men of especial training. The case has rarely been better stated than it is by Mr. Requa and we commend it to our professional brethren. He asks for co-operation between the miner—as represented by the mine manager—and the scientist, as he comes in the person of a geologist. No man can cover every phase of an industry so broad as mining; the big blunders are made by those who think it a sign of weakness to disclaim full knowledge of a special subject. As a matter of fact, the manager of a big mine is so absorbed in his executive duties, in the commercial part of the business and in his routine work, that it is rarely he can expect to make a proper study of geological conditions underground. Every mine is not a geological puzzle; some are plain sailing for years at a time, but when geology is a factor, it becomes paramount. In such cases it is the superintendent or a wide-awake observant shift-boss who puts two and two together; often with success, but just as often without it, simply because the problem is one that requires more than local knowledge and more than the most illuminating of horse sense. It is then that the manager, if a broad man, with the courage of his convictions, will ask his directors to send a good geologist, versed in ore deposits, to his assistance. At such a time the manager will be fortunate if he has made the acquaintance of one or two geologists and is able to choose his specialist, instead of leaving the selection to his directors.

There is a reason for the growth of specialization in mining geology and we shall state it frankly without incurring the risk of being misunderstood. The typical American mine manager is not a geologist nor necessarily is he a good miner; he does not go underground often enough. The ability which has placed him at the head of his profession, for example, in Africa and Australia, is not that of a successful finder of ore nor that of a skillful miner of such ore when found; he is pre-eminent as a business man, first of all; as an intensely energetic resourceful man of affairs; often he is a clever mechanical engineer, and therefore a successful designer of mills and reduction works, but neither by heredity nor by training is he a good miner. There are exceptions—please note—but we speak of the type that has done such credit to the name of American mining engineer. Now, the explanation for this is not far to seek. He does not care to go underground any more than the American workman cares to do so. The miners of the world today are Cornishmen, Finns, Italians; the trammers are Irishmen and Swedes; the timbermen are Cornish again, with Austrians, Welshmen and Piedmontese. The native American is at surface; he is holding the brakes of the hoist, he is working the lathe in the repair shop, he is carpenter, blacksmith, mechanic; he is in the mill. In our issue of last week, Mr. Plate called upon the younger men to make friends with the mine superintendent and shift-boss; it was sound advice. We also advise them to spend more time in the mine, and learn—what some excellent people overlook—that more money is lost by bad mining underground than by poor milling or insufficient machinery at surface. Geology in its application to mining is not learnt in the sunlight nor under the soft rays of a student's lamp, it is acquired in the dim places of the underworld where keen observation is the wick and logical reasoning the oil, of a lamp guiding the miner through a darkness that can be felt. Men engage doctors when they are ill, instead of hiring them to keep them in good health; so also mine operators and managers engage a high-priced specialist when they have become thoroughly tangled in geological perplexity instead of regularly retaining a competent adviser, whose salary per annum would be no more than that of the specialist who comes once and for a short time to study conditions with which previously he may have had no acquaintance whatever. We bespeak a better recognition of the importance of geological knowledge and mining experience as applied underground; it is the necessary foundation for the business insight that directs operations at the surface.

The Price of Tin.

Tin is fetching a high price these days. It sells at New York for 36 cents per pound, while the average price in 1904 was 28 cents. The world produces only about 90,000 tons of the metal at the present time, the output of the Malay States having declined about 5 per cent, while the Australian production has increased slightly. In Alaska there is promise of production, but the supply from this source has not yet affected the market. The world's consumption of tin (of which the United States takes nearly one-half) has overtaken the output and the stocks of 40,000 tons in January, 1897, have dwindled to 13,500 tons in January, 1906. It is the known smallness of the visible supply that has caused such speculation in the metal; the consumers are carrying only the amount absolutely necessary and are living from hand to mouth. Owing to the time—three months—required to carry tin from Singapore to New York, a tonnage equal to a quarter of the annual consumption in America is unavailable at any time. Any check to regular shipments will precipitate a famine in tin. Unless the supply is forthcoming and production is put on a healthier basis, it is likely that a substitute will be sought by those who now use tin for plating iron.

Absorption of Mineral Land.

Absorption of valuable mineral land by railroad corporations has gone so far as to elicit vigorous protest by those who have a care for the future of Nevada's mining industry. Senator George S. Nixon, of that State, has presented a petition to Congress asking that a commission be appointed to enquire into the matter; this petition has been referred to the committee on Public Lands. Those who feel that action is imperative, will do well to write to their representatives in Congress, asking them to support the measures already taken. The intention is to appoint a commission similar to that which exists already in the States of Idaho and Montana, the duty of which is to pass on the character of the lands within the grants made to railroads. While the law giving the railroads certain concessions of territory is not attacked, there is vigorous protest against the rulings of the Land Department whereby they are given more than they are entitled to receive. In making grants to the several States and in aid of the construction of railroads, the Federal Government expressly provided for the reservation of mineral land. From the first it was the settled policy of the Government to reserve such mineral land, from sale, from pre-emption, and from all grants whether for railroads, public buildings or other similar purposes. The Acts of 1862 and 1864 contain provisos to this effect. The Land Department has jurisdiction over railroad lands, until patents are issued, for the purpose of determining whether the conditions have been complied with. It is said that in advertising the application of railroads for such land, the officials of the Department choose newspapers a hundred miles or more from its location; and the notices are so phrased that their import is not readily deciphered; this has caused bad feeling in Nevada which was aggravated by the publication recently of a letter wherein the Commissioner of the General Land office said that "there is no authority for the insertion in patents issued under railroad grants of the clause (exempting all mineral lands, should any be found in the tracts aforesaid) and directions are given that in all future railroad patents, said exempting clause be excluded." Clearly it is time to ventilate this important matter, and to prevent the alienation of mineral territory belonging to the people.

By the Way.

At the anniversary meeting of the Royal Society held recently in England, Sir William Huggins took for a text the influence of modern science upon the life and thought of the world. He said:

The influence of science during the last 50 years has been in the direction of bringing out and developing the powers and freedom of the individual, under the stimulation of great ideas. To become all that we can become as individuals is our most glorious birthright, and only as we realize it do we become, at the same time, of great price to the community. From individual minds are born all great discoveries and revolutions of thought. New ideas may be in the air and more or less present in many minds, but it is always an individual who at the last takes creative steps and enriches mankind with the living germ-thought of a new era of opinion. All influences, therefore, and especially all laws and institutions which tend to lose the individual in the crowd, and bring down the exceptional to the level of the average, are contrary to the irresistible order of nature, and can lead only to disaster to the individual and in the State.

I should not omit to mention the marvellous secondary effects of scientific discoveries upon the mental progress of the civilized world which are being wrought by their practical applications to the cheapening of paper, and to improvements of the automatic printing press, which, combined with the linking together of all parts of the earth by a network of telegraphic communications, put it in the power of even the poor of the realm to read daily the news of the world, and for a few shillings to provide themselves with a library of classical works. Of scarcely less educational influence upon the public mind are the new methods of photography and mechanical reproduction by which pictures of current events and the portraits of those who are making contemporary history, and also copies of the world's masterpieces of painting and of sculpture, are widely disseminated with the cheap newspapers and magazines among the mass of the people. Golden will be the days when, through a reform of our higher education, every man going up to the universities will have been from his earliest years under the stimulating power of a personal training in practical elementary science; all his natural powers being brought to a state of high efficiency, and his mind actively proving all things under the vivifying influence of freedom of opinion. Throughout life he will be on the best terms with nature, living a longer and a fuller life under her protecting care, and through the further disclosures of herself, rising successively to higher levels of being and of knowledge. The importance to every man of a practical acquaintance with elementary science is obvious. Would it be thought possible that any nation could act so absurdly as to teach its children other languages, and leave them in complete ignorance of the tongue of the land in which they would have to pass their lives? Would it not then be incredible, if it had not become a too familiar fact, that the public schools have, until recently, excluded all teaching of the science of nature from their scheme of studies, though man's relation to nature is more intimate than to his fellow countryman? We live, move and have our being in nature; we cannot emigrate from it, for we are a part of it. Yet our higher education leaves men, who in other directions are well informed, much as deaf-mutes in the presence of nature. They do not hear her most imperative warnings, and can only get on haltingly in their everyday intercourse with the natural forces to which their lives are subjected, by means of the arbitrary signs of empirical custom. The recent introduction of some amount of science-teaching in our higher schools is inadequate, in kind and in degree.

Two faculties of the mind, which it is of the highest importance, especially in early youth, to enlarge and develop by exercise, are wonder and imagination. Under the ordinary premature language-teaching of the grammar schools, even the wonder and imagination natural to young minds become so stunted in their growth as to remain more or less dormant throughout life. On the other hand, natural science brings them into full activity and greatly stimulates their development. Nature's fairy tales, as read through the microscope, the telescope and the spectroscope, or spelt out to us from the blue by waves of ether, are among the most powerful of the exciting causes of wonder in its noblest form; when free from terror it becomes the minister of delight and of mental stimulation.

And surely the master creations of poetry, music, sculpture and painting, alike in mystery and grandeur, cannot surpass the natural epics and scenes of the heavens above and of the earth beneath, in their power of firing the imagination, which, indeed, has taken its most daring and enduring flights under the earlier and simpler conditions of human life when men lived in closer contact with nature and in greater quiet, free from the deadening rush of modern society. Of supreme value is the exercise of imagination, that lofty faculty of creating and weaving imagery in the mind, and of giving subjective reality to its own creations, which is the source of initial impulses to human progress and development, of all inspiration in the arts, and of discovery in science.

CONCENTRATES.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

WATER used in mixing concrete should be clear and free from sulphuric acid or strong alkalies.

THE San Francisco Mint was established in April, 1854. It has coined more than one and a half billion dollars in gold and silver.

'TAILINGS' from stamp-mills should always be conveyed far enough so that in the future their accumulation will not prove a source of expense.

WHEN there is a poverty of lead in lead-silver ores treated in a smelting furnace, and excess of zinc and magnesia, there is usually a heavy loss of silver in the slag—from 1½ to 4 oz. per ton.

THE largest output during any single year of the Comstock was in 1877, when it produced $14,520,614.68 in gold, and $21,780,922.02 in silver, from ore, and $1,169,265 from tailings, a total of about $37,500,000.

IF delayed assessment work on an unpatented mining claim had been commenced before January 1st and was continued until the full $100 worth had been performed the claim was not subject to re-location, and title still rests in the original proprietor.

THE peculiar silicious, granular ores of the Great Republic mine at Republic, Washington, were not shipped to smelters to be used as flux, but to line converters, for which purpose it was peculiarly adapted, consisting of a semi-pulverized mass of quartz, ranging from small lumps down to fine sand.

THE function of the canvas slime-plant is to save the extremely fine sulphides which escape vanners or other kinds of mechanical concentrators, where sizing and classification are not practiced. Where a properly designed and operated sizing and classification process is employed the slime-plant is generally not required.

RHYOLITE is scarce in the Coast range of California. One occurrence is known in Santa Clara county, near the New Almaden quicksilver mine, and north of Berkeley is an extensive outcrop of soda-bearing rhyolite of unusual variety. Although this latter rock contains finely disseminated pyrite, no occurrence of gold or silver in it has been reported.

THERE is no relation between altitude and the value of a mine, excepting the economic relation of cost and output. It is a bad idea for the prospector to entertain hard and fast rules in relation to any matter having a bearing on prospecting, either as to the kind of rock in which to search for mineral or as to the altitude at which payable ores may or may not be found.

THERE still remain in California several hundred miles of undeveloped and practically unknown ancient, gold-bearing, river channels. The uncertainty of their depth and position, as they are buried beneath hundreds of feet of later lava, renders their discovery and development somewhat hazardous, but as a class the mines of the ancient channels have been largely remunerative.

MUCH ATTENTION has been given by some investigators to the electro-magnetic currents noted in mines in connection with ore bodies, but as yet it is not known that any practically valuable deductions have been made from these studies, except possibly to afford fakirs of the 'divining rod fraternity' the means of promulgating a class of scientific literature with which to be-fool the ignorant.

NARROW slit-like cracks, which cross the schistosity of greenstone and other rocks, are called shrinkage cracks and are supposed to be due to some stress which caused the rock to stretch, with the opening of the transverse cracks referred to. Sometimes they are found as open spaces, and occasionally are found filled with calcite or quartz, or some other mineral, infiltrated since the formation of the cracks.

THE mines of Cœur d'Alene district of Idaho are not situated in high rugged mountains, but in smooth-sloped hills, at altitudes ranging from 3,000 to 4,500 ft. The rocks of the district are slate, quartzite, gray-whacke, syenite and some small dikes of basic rock described as basalt. The principal mines are in the quartzite, though ore also occurs in the syenite, near its contact with the sedimentary rocks.

IN an alkaline solution, hydrochloric acid, and also nitric acid, may cause a precipitate when there are present either silicic acid, boracic acid, antimonic acid, tungstic acid, molybdic acid; also oxides soluble in alkalies (such as plumbic oxide or alumina, soluble in excess of nitric acid), as well as metallic cyanides and ferrocyanides, and all metallic sulphides soluble in ammonic sulphide. A precipitate of sulphur may also be formed in soluble polysulphides and hyposulphites.

WHERE the general fall of a country is much greater than is necessary in the construction of a ditch line, the excess of grade may be equalized by giving the ditch a heavy fall at some place where no damage will result from cutting. Where on the ditch the earth or rock is so porous that there is a heavy loss by absorption, it is better to lay a flume or pipe on the grade until such bad place has been passed.

NO ONE believes a lawyer can master his profession in a month or a year by simply reading law, nor can one become a competent civil engineer without a long course of preparation, to which must be added practical experience. The mining engineer must take a course more extensive and comprehensive than that of any other profession, and yet many people think anyone can successfully operate a mine.

SO FAR as known to "Concentrates" no one has yet been able to satisfactorily explain the origin of the peculiarly matted and twisted wires of native silver occurring in many ores. These are particularly abundant in Arizona and Colorado. They often look like wires which have been drawn through a ragged plate, and are found twisted, gnarled and interwoven in a strange and unaccountable way.

THERE is a law on the statute books of California making it mandatory for a mine worked by shaft, either vertical or incline, to have two shafts connected by level when the workings exceed 300 feet in depth, but no attempt has ever been made to enforce the provisions of this law. In the Mother Lode region many adjacent properties are connected underground, which aids ventilation and meets the requirements of the law.

DIATOMACEOUS EARTH (infusorial earth) is used as an absorbent and also more extensively as a fine abrasive, such as tripoli, rottenstone and other polishing powders. It consists principally of silica and is often so fine in texture as to convey little sense of grit to the touch. It has also been successfully employed as a covering for steam pipes, boilers, etc., and it has been suggested that it would make good material for filling fireproof safes.

THE highest and lowest places in the United States are in Inyo county, Cal. Mount Whitney is 14,522 ft. above the sea, and Death Valley, 50 miles southeast of Mount Whitney, is 300 ft. below the level of the sea. It is said that Mount Shasta and Mount Whitney may both be seen from the summit of Mount Diablo, in Alameda county, on a clear day. The distance from Diablo to Shasta is 244 miles, and from Diablo to Whitney 222 miles.

WHEN a copper furnace has become dark in the tuyere zone, and the fire has worked toward the top, one good way to remedy the difficulty is to feed matte charges instead of ore. Unless the trouble has advanced too far, the tuyeres will soon become bright again, when the matte charges may be decreased to one charge of matte to two or three or more charges of ore. Another method is to reduce the blast somewhat and plug some of the tuyeres temporarily.

THE so-called "Joshua" trees of the Western desert region are a species of yucca, portions of which upon drying sometimes become very hard, and make excellent fuel. The greater part of the tree is almost useless for fuel, but the hard, dry pieces, which may usually be found scattered about on the ground in the yucca country, are superior to any other kind of fuel found on the desert. Ironwood and mesquite are also used for fuel on the desert.

THE amount of water required per ton of ore treated by coarse concentration varies with the character of the ore, those ores containing much clay or talc requiring more water than those of purely silicious or other brittle gangue. Generally it is about 4,000 gal. (about 15 tons) to one ton of ore. Where water is scarce much of it may be pumped back from settling dams for re-use, when the loss may not exceed 25%, which greatly cheapens the cost of water required.

THE lead-silver ores of Leadville, Colorado, are supposed to have been deposited in the limestone strata, where they are now found, at a depth of probably 10,000 ft., as indicated by the regional geology of that portion of the Mosquito range. Subsequently the rocks were fractured, faulted and slowly uplifted, while glaciers and other erosive agencies combined to disintegrate and scour away the overlying sediments and porphyries, thus exposing or bringing the ore deposits near to the surface.

THE most important theories advanced to account for the occurrence of petroleum in Nature are: 1. That it is the result of chemical affinity acting on mineral matter. 2. That it is the result of partial decomposition of organic matter, either vegetable or animal, that has been stored up in the rocks. 3. That it is of direct volcanic origin. The last seems entitled to little consideration, as no direct evidence has been produced to support it, and no petroleum is known to occur in large amount in association with volcanic rocks. Petroleum differs in composition and character in different regions and in different rocks. No one theory of the origin of petroleum satisfactorily accounts for all of its many variations of character and occurrence.

A GALLON of water contains 231 cubic inches and weighs 8⅓ pounds. In making cyanide solutions exact calculations are not made. For instance, a 1% solution is made by dissolving 20 pounds of cyanide of potassium in a ton of water. The addition of the cyanide makes the solution weigh 2,020 pounds, so that the amount of cyanide present is really less than 1% of the total weight. The conventional method of making up solutions is convenient and devoid of hair-splitting niceties which would be without practical benefit.

PORTLAND cement is made by mixing in proper proportions calcium carbonate and clay which are heated to expel moisture. The mixture is then pulverized and calcined at a high heat, which produces the so-called clinker which is then finely ground. Cement, to be of usefulness, must pass a screen of 10,000 meshes per square inch. Cement for tests, taken from barrels, is obtained by boring a hole through one of the staves about midway between the heads of the barrel and removing a portion of the mixture with a sampling iron similar to those used in obtaining samples of moist concentrate in a stamp-mill.

WHERE it is deemed advisable to re-grind a portion of the tailing from a mill, an arrangement should be made to accomplish this automatically and at as little expense as possible. If the coarse sand requires re-grinding, it can be separated from the fine by the employment of hydraulic classifying cones or other similar devices. This coarse sand may then be sent to a grinding mill situated on some lower level and operated by surplus or auxiliary power, the sand feeding and discharging automatically. By an arrangement of this kind the cost of re-grinding tailing is reduced to a very low figure, as no particular attention need be given it, the expense being chiefly for power and wear of working parts.

THERE are several ways in which small shafts and tunnels of ordinary cross-section and length may be ventilated. Among these are the windsail, which, catching the passing breeze, forces it through a pipe to the working face; the furnace built at the surface and connected with the ventilating pipe, which draws the foul air from the mine, its place being taken by pure air which flows into the opening; the water blast, in which a column of water falling into a vertical pipe imprisons air as it falls and drives the air into the mine through the ventilating pipe. The ventilating fan is the most commonly employed, but the substitutes previously referred to are generally less expensive in operation.

MOUNT SHASTA and Lassen Peak, in California, together with the several score of lesser volcanic cones and vents, have ejected an enormous amount of material in the past. The accumulation of volcanic rock is several thousand feet in thickness, filling a great pre-existing basin which once separated the northern end of the Sierra Nevada from the Klamath mountains of northern California and southern Oregon. The latest volcanic eruption in California, and probably in the United States, is that at what is known as the cinder cone, about 10 miles east of Lassen Peak. In the bed of cinders and ashes which surrounds this cinder cone still stand the snags of pine trees, killed by the heat and gases accompanying the last eruption of volcanic debris in this country. Just how long ago the last outburst occurred is not positively known, but is placed within 100 years. Although no eruption has occurred since the settlement of the State by white people, there is no assurance that an eruption may not recur in the Lassen Peak region at any time, though there is no indication of any such approaching catastrophe at present. There are numerous hot springs and steam vents in the region which indicate that the fires are only slumbering.

THE usual method of estimating the horsepower for a mill is by units of five stamps to each mortar. Multiply the weight of a single stamp by the number of stamps in each mortar, and this by the height of drop in feet, and the product by the number of drops per minute. This gives the foot-pounds. Add to this from 25 to 30% for friction. Divide the whole by 33,000, and the result will be the power required for each unit of five stamps. A 40-stamp mill having 1,000-pound stamps, dropping 6 inches 100 times per minute, would then require for the stamps alone, $1,000 \times 5 \times 0.5 \times 100 = 250,000$. Add to this 30% for friction $= 325,000$ foot pounds $\div 33,000 = 9.85$ h. p. for each five stamps and for 40 stamps eight times as much, or 78.8 h. p. For rock-breakers, concentrators, clean-up barrels, and other machines used in and about the stamp-mill, it is usually safe to figure 3 h. p. to the stamp, and this will be found sufficient where the stamps do not exceed 1,000 pounds in weight. If much heavier and dropping faster than 100 times per minute, a larger factor must be allowed. Often mills which are hastily built of unseasoned lumber, although properly planned and the shafting placed with care, on drying the shafting is thrown out of line by the warping of the timbers. This is a contingency which may be anticipated, and the shafting should be gone over quite frequently the first year or two and readjusted, or the loss by friction will be heavy.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

FINE GRINDING.

The Editor:

Sir—In the discussion on this subject in your issues of December 16 and January 27, several interesting questions arise. Is fine grinding necessary to the highest extraction by cyanide? Does fine grinding improve amalgamation? Are the best commercial results obtained by fine grinding? Mr. Doveton's definition of the term will bear amplifying. In this country 'fine grinding' is generally understood to mean a secondary comminution of the mill-tailing through 150-mesh or finer, after the usual mill treatment by amalgamation or concentration, or both. All the parties to this discussion seem to be of one opinion as to the effectiveness of this secondary grinding. Even Mr. Doveton, who is apparently not a very warm advocate of the system, concedes, by implication, that it aids extraction, but is only in a few instances commercially profitable. It seems to be a settled fact then that cyanide solutions will yield the highest extraction from finely crushed material. The exceptions to this are so rare that the fact may be safely accepted as one of the axioms of cyaniding.

The effect of fine grinding on amalgamation is a subject which, curiously enough, has been thrust into prominence by recent developments in cyaniding. I do not know of any instance where amalgamation is used after the fine grinding or sliming operation; although it is said to have been tried with some success in South Africa, and in Korea. I think it has been the experience of mill-men that crushing finer than the approved and traditional 30 or 40-mesh rather hinders than aids amalgamation. In the Goldfield district, Nevada, the practice is to re-crush the coarsest of the 16 or 20-mesh product from the stamps in Huntington and Bryan mills. This has the effect of brightening the characteristically reddish-colored gold of the district, as well as to release the mineral imbedded in the coarse particles of quartz, and the use of large amalgamating plates after the second crushing has been of distinct advantage. My belief is that amalgamation, in cases where the gold does not amalgamate readily, and where re-crushing is necessary for the highest extraction by cyanide, may be best carried on in two stages, especially where—as in the case of the Combination mill at Goldfield—the second crushing does not reduce the ore to finer than 40-mesh. When Mr. Wann speaks of "fine grinding having proven a pre-requisite for the highest extraction by amalgamation and cyanide leaching of gold ores," he implies that it is now considered an essential to good amalgamation. It would be interesting to know of the special instances wherein this practice has improved amalgamation.

Mr. Doveton's views on fine grinding, discrediting this aid to high extraction as commercially unprofitable, will be received with some surprise by companies now using tube-mills in this country and in Mexico. Several such mills are in operation at El Oro; Mr. Butters is installing them on his Mexican properties; the Liberty Bell company at Telluride, Colorado, and the Standard company at Bodie, California, have tube-mills in operation, apparently at a cost per ton which justifies their use. If fine grinding is a commercial success in Australia and at the various properties above named, all working on dissimilar ores, it must have decided merits. Obviously, the profitableness of this additional grinding will depend in each case on the margin of saving. If sliming a $2 sand will raise the extraction by cyanide from 80% to 90% and the operation costs 50c. per ton, manifestly it will not pay. But if such an increase of saving is made on $10 sand, it *will* pay. It seems impossible to generalize briefly in estimating the value of a process, the success of which must depend upon so many inherent conditions. My own experience in fine grinding has been somewhat happier than Mr. Doveton's; though I must admit that, while an advocate of this method, I have not had occasion until recently to instal a tube-mill or grinding-pan. What knowledge I have of the subject has been gathered from experimental work and from available data of plants in operation. I assume that Mr. Doveton has drawn his conclusions from reliable results, that is, from fair tests on a working scale over a considerable period. Obviously a mere experimental test to determine cost of treatment would not be conclusive. Those interested in this important subject would be glad to know specifically from Mr. Doveton the cases in which he met with failure in plants resorting to fine grinding on a scale large enough to afford reliable data. Such information would be of especial value at the present time.

In the treatment of silver ores by cyanide I am disposed to take a middle ground between the extreme views held by Mr. Wann and Mr. Doveton. Agitation of finely crushed silver ores for the long period usually required for the best extraction is in most cases neither practicable nor economical. In the treatment of such ores I have obtained the best commercial results by re-grinding to a fine sand (60 or 80-mesh) and leaching this product from 15 to 20 days, after a careful separation of the slime. The pure slime, by reason of the fine state of division of the mineral, does not require more than three or four days' agitation for the best results.

Mr. Doveton calls timely attention to the Blaisdell apparatus for emptying and filling tanks, and for carrying sand from one tank to another. The merits of this system from all points of view were tried and proved at the Butters plant at Virginia City. I am informed that two large cyanide plants now in course of erection in Mexico are to be equipped with this apparatus, as well as the new 500-ton cyanide plant of the Tonopah Mining Company at Tonopah, Nevada. In districts where the price of labor is high, or where cheap labor is uncertain and unreliable, as in parts of Mexico, the value of a mechanism of this sort is incalculable.

The evolution of slime filtering is one of the most interesting of recent developments. Filter-presses were never popular or much used in America. The Moore process, at first installed at the Golden Gate mill at Mercur, Utah, was soon discarded, but was later introduced at the Lundberg & Dorr mill at Terry, South Dakota, at the Liberty Bell mill in Colorado, and at the Standard Company's mill, at Bodie, California. At all of these places it is said to be operating successfully. Cassell introduced an important modification of the Moore filter by practically reversing the operation, that is, conveying the pulp and the various solutions to a box carrying stationary filters, instead of shifting the filters, as in the Moore scheme. The merits of these two types of filters were thoroughly investigated at Virginia City, where, after several months of quiet and earnest work, the Butters-Cassell filter, so-called, was finally evolved. This is now in use at the Butters plant, where 150 tons of slime per day are being filtered at a cost of 11½c. per ton. The system is very simple and works with a convincing smoothness and precision which appeal at once to the practical eye. At the mill of the Combination Mines Company at Goldfield, this process is being installed to treat 40 tons of high-grade slime per day. The filter-press which has been in service for several months will be discarded as too expensive to operate.

FRANCIS L. BOSQUI.

San Francisco, January 27, 1906.

MINING ENGINEERS AND GEOLOGISTS.

The Editor:

Sir—There is much that is true in what Mr. Forbes Rickard writes, but surely it is hardly fair to the mining geologists, to picture one "who has crowned himself with a halo of self-approval" and contrast him with some accomplished mining engineer, who is assumed to be possessed at once of thorough experience in his profession and gifted with good 'horse sense.' Is it not true that in every walk of life we meet souls enveloped, as the mountain top is hidden in the cloud, in an atmosphere of self-approval? A Norwegian minister once asked me: "Why is it a man what thinks he knows everysing, knows nothsing?" I assented to the often observed fact and awaited the explanation: "It is the act of God; if God let him know anysing, he would remind God of it dis-a-gree-bly. It is ze self-protection of God."

What is the object of scientific training? Is it not to prepare the mind to observe and to reason from that which has been observed? As the crust of the earth is—by fissuring and the intrusion of igneous rocks—prepared to receive and to concentrate within itself the later deposited ore—so the brain can be trained to be in the highest degree receptive and to classify the facts observed. Why does the scientist know more than the man of equal ability but without the preliminary training, who has devoted the same number of years to his profession? May it not be because one has been like a savings-bank, receiving and accumulating the observations of the most intelligent investigators and thinkers in all parts of the world and adding them to his own wealth, while the other has mainly his personal store of observation and experience. Within the country he knew, the practical man would have the superior knowledge, until he came to deal with conditions that were beyond his experience. The best possible work would result, were the geologist and the mining engineer to unite their forces.

There are, however, many questions in mining which are purely geological. Take, for instance, the case of a vein nearly vertical in attitude, cutting through flat-bedded formations and changing its wall-rock with every change in the strata. The mine has been very productive in the upper levels where the vein traversed hard crystalline rocks, and the question arises: to what depth will these favorable conditions continue, and what will be the nature of the underlying formation with respect to the occurrence of ore? Will the vein become barren on entering the lower beds? Then there are a great variety of cases where the ore is cut off by a fault. Was the ore there first, or was the fault formed prior to the ore and the mineral deposited against the fault-plane? If from any cause the output of the mine is decreasing and new orebodies must be sought in unexplored parts of the property, the services of the mining geologist are of value in determining the areas which shall be explored. Sometimes he is called upon to direct the work; to determine at the outset the probable position of the 'mineral centers', the places where the main up-flow of the waters bringing in the ore has occurred, and to plan the work so that the exploration shall be confined to a limited area, surrounding such centers; for often it is not economically practicable to cross-cut and explore all the territory owned. A railroad proposes to build a branch to a mining camp; it has been ascertained that the mines have sufficient ore developed to last two or three years, the mining geologist is called upon to determine the probable life of the camp, to give his opinion as to the output, after the reserves are exhausted. Other instances might be given where there is no occasion to apply "the gauge of the sample, the assay-office and the tape."

There are mining geologists who are mining engineers as well "who are not afraid to meet the commercial question"; but I feel sure that Mr. Rickard did not intend to hit at that class. He is to be commended for the courteous and conservative way in which he handles the subject, for he shows that he can hit hard.

WALTER P. JENNEY.

San Francisco, Jan. 20, 1906.

MINING ENGINEERS AND GEOLOGISTS.

The Editor:

Sir—The communication from Mr. Forbes Rickard, in your issue of January 6, touches upon a subject that is of material importance to the mining public. So far as I know, there has been but little discussion of the relations of the so-called 'Mining Geologist' to mining enterprises. I am somewhat averse to the use of the term 'Mining Geologist,' as placing an undesirable limitation upon the work of a geologist, and at the same time giving an erroneous impression of his field of usefulness. I have not in my experience come in contact with any really eminent geologist, who would be willing to accept the name of 'Mining Geologist' as a limitation to his work; nor, in fact, have I ever met any geologist, who, standing alone, was able to pass upon problems surrounding mining work.

In its transcendent dress, geology is not adapted to the solving of purely commercial problems, and specializing in this field, in my opinion, has a marked tendency to unfit the specialist for any work other than strictly geological investigations. There is, however, a relation between the geologist and the mine manager, that can be established with marked benefit to both. With the mine manager, the question paramount is the deriving of profits from a property; and the geological problems that may be developed are attractive to him only in their bearing upon the financial part of the question. Unfortunately with the geologist, it is often a question of mere geological phenomena, in the solving of which the commercial aspect is entirely lost sight of. To the mine manager the minute differentiation in rock structure is not a matter of vital importance. Unfortunately, however, the geologist views these finer determinations with much enthusiasm and often more interest is manifested than in the discovery of large areas of pay-ore. To the specialist in geology, a vein may be entirely barren of valuable minerals, but if it presents complex structures, it may attract his attention far more than the simple vein-structure which carries ore in payable quantity, but which presents no geological problems.

There is a field for the geologist in mining work, exactly as there is a field for the mine manager, and it is when confined to this field that the results of the geologist's investigation will be most beneficial to all concerned. To secure the greatest benefit from his labors, his work should be directed by the mine manager, who has certain commercial problems to solve, in the solving of which certain geological questions must be determined. When the mine manager has satisfied himself upon the points regarding which he wishes enlightenment, it is opportune to call upon the geologist and explain the particular geological problem and get from him a solution. That the solution may be incorrect is quite possible, but it is the province of the mine manager to then determine whether the solution is one that from a commercial standpoint admits of satisfactory determination by further mine exploration; or it may be that the solution points to the abandonment of the undertaking. The mine manager must examine carefully all phases of the question and then determine for himself the amount of weight to be placed upon the geological report submitted to him.

The modern mine manager, if at all competent for the position he occupies, is necessarily more or less versed in geology as applied to mining problems. He may, in fact, be much better fitted, from his long association with any given property, to solve the question than the specialist who is called in consultation.

All properties of any magnitude should have a geological map of their holdings; this information may be at times of extreme value. This is not so

applicable to the simple vein-structures of California as to the irregular deposits of Nevada and to other similar occurrences where the precious metals are not confined within any well-defined area. It is in these formations that the work of the geologist becomes of great value, and, taken in connection with the knowledge of the mine manager, presents a combination desirable in the extreme.

It may be possible that the future will develop mining geologists who will also be mine managers, but of this I have grave doubts. The man who confines himself to specializing in geology comes to view minute alterations of rock from the wrong end of the telescope. He is a scientist pure and simple; to him fossils and non-mineral bearing rocks are of quite as much interest as the highest grade of ore. I believe that the most satisfactory results will be attained, not in attempting to educate geologists to the point of mine management, but rather in impressing upon the mine manager the necessity and desirability of calling upon geologists at times for an opinion, and then intelligently passing upon it and determining whether it is feasible from a commercial standpoint.

M. L. REQUA.

San Francisco, January 15, 1906.

AMALGAMATION IN CYANIDE MILLS. — One of the results of the impetus given to fine grinding is the discovery that much greater returns can be obtained on the plates from the slime product. The usual practice is to flow the pulp over ordinary silvered plates, and then, after re-grinding, over shaking plates. But, even without shaking plates, fine recoveries have been shown. Thus Holloway, in Korea, has increased his amalgamation extraction on an ore containing much pyrrhotite by no less than 50%. Denny shows that, while the plus 60 mesh product yields scarcely any result by amalgamation, the plus 100-mesh yields about 57% on the tables; the plus 150-mesh no less than 78%; and the plus 200-mesh an extraction of 83% on the plates only. Caldecott points out a similar experience; namely, that the bulk of the amalgamation extraction on the Robinson Deep is derived from the fine material; indeed, he calculates that both the Robinson Deep and Simmer & Jack recoveries on plates amount to almost exactly 90% of the gold content of the sand passing 90-mesh, assuming the gold on the coarser sand to be untouched.—Alfred James in *Eng. & Min. Journal.*

SAFETY LAMPS.—In a recent test of safety lamps for mines, by the Belgium government, at Frameries, it was definitely settled that there was no more danger of explosion with lamps fed with mineral oil than with those fed with vegetable oil. The lamps fed with light mineral oil gave much better light and gave better opportunity for using automatic re-lighting devices, although these have not yet been perfected so as to be absolutely safe and reliable. The miner had better retire to the surface or to a lighting station before trying to re-light a lamp. Tests with a number of standard lamps showed that there was no danger of explosion from coal dust.

Anderson's Method for Passing a Survey Line Down a Shaft.

Written for the MINING AND SCIENTIFIC PRESS.

This is a survey method invented by a prominent mining engineer who was on the Comstock and at Bodie in the early 'eighties. To do the work there is required:

A coil of fine steel wire (pianoforte wire).

Two heavy weights; for deep shafts, the ordinary cast-iron stamp-heads may be used.

Two 5-gal. cans, partly filled with heavy lubricating oil; for deep shafts, tubs, made from half-barrels, may be employed.

Two drawing-boards (see Fig. 1).

A pocket case of draughting instruments.

Two steel straight-edges.

It is assumed that two points, from which the wires are suspended, have been located at the top of the shaft, marking the line. At the station (to which it is desired to carry the line) suspend the plumb-bob in the oil, moving the can until the weight swings freely; pile the square timbers to support the drawing-board as shown in Fig. 2; pass the weight through the slot and adjust the board so that the wire centers in the opening. Level the board and fasten it to the timbers by gimlet-pointed wood screws.

Place the straight-edges parallel and on either side of the wire in some one of the several positions shown in Fig. 3, as AA and BB; watch the swing of the weight, and gradually move them until in a single oscillation, with conditions apparently normal, the wire touches each straight-edge, and draw the pencil lines AA and BB. Repeat with the straight-edges in the position CC and DD, and draw the lines CC and DD tangents to swing of the bob and at right angles to the first set AA and BB. Determine in the same manner, as many lines, EE and FF, GG and HH, tangent to the curve described by the oscillating wire, as may be required.

Detach the weight from the wire and place in position the centerpiece, fitting tightly the opening. Draw the lines AA, BB, CC, etc., across the plug and with a pair of dividers, find the center X_1, of the oscillation, marking the point with a small tack or pin.

In the same way, determine the position X_2; the center of the curve of oscillation, for the second plumb-bob. A wire stretched over the points X_1X_2 will give the approximate line, and on its prolongation, a station for the transit may be selected. It requires but a few movements, with an instrument provided with a movable head, to set upon the line X_1X_2 prolonged.

Mark the line by fore and back-sights; let the instrument stand; erase the pencil lines on the board with sandpaper; hang the weights upon the wires and make a new determination of the centers of oscillation, X_3 and X_4.

The second approximation of the position and direction of the line should coincide with the first, within the allowable limit of errors. Repeated determinations can be made rapidly if desired. When there is a strong current of air through the shaft, it is advisable to cover the top of the shaft and close the main airways. Frequently the current of air changes in direction at different times in the day or night, and it is well to make independent determinations under the changed conditions.

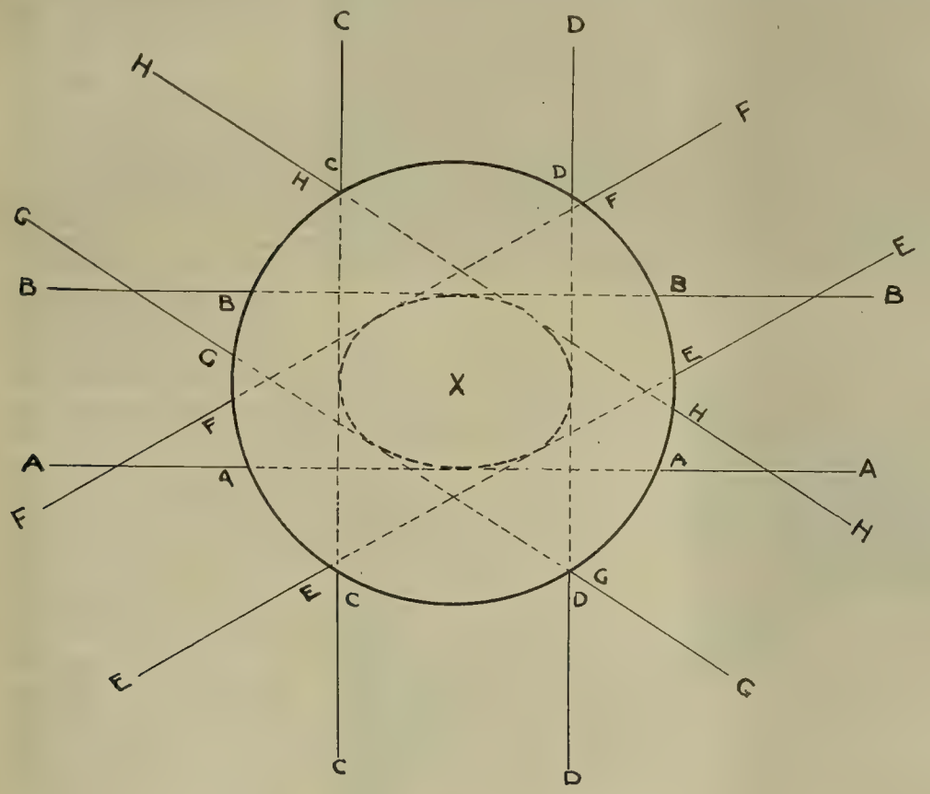


Fig. 3.

The Shay Geared Locomotive.

The most conservative estimate places the number of locomotives operating on the 214,000 miles of American railroads at 500,000; there are also about 125,000 American-built locomotives in operation in other countries.

If the American locomotive is the best of its kind, so also is the Shay geared locomotive the best for the particular classes of work it is meant to do. Direct connected locomotives require certain pre-arranged conditions for their successful operation. They do their best work when everything else is right, but the Shay adapts itself to conditions and can be run to advantage where not only no other type of engine, but the road itself, is well nigh impossible.

The entire locomotive is strongly built, liberal use being made of cast steel in the construction. Its flexibility makes it possible to operate the largest locomotive on curves of 100 ft. radius, while the smallest are sometimes used on curves of 30 ft. By reason of the construction, the weight is widely distributed, and there being no reciprocating or revolving parts directly connected to the driving wheels, there are no 'hammer blows,' so that very light rail can be used. The cylinder arrangement (three at 120°) and the low center of gravity make the locomotive steady, so that it is possible to run safely at a speed of 20 miles an hour. Very heavy grades can be operated, Shay locomotives being in regular operation on grades of 16%. This is due to the large number of impulses (12) per revolution of the driving wheels, which give a torque as regular as an electric motor, whille the direct locomotive, with four impulses, is liable to slip when the high admission pressure is exerted on the pistons. By means of the gearing, the locomotives are given all the tractive power that the adhesion permits.

Shay geared locomotives are at work on almost every road on the American continent where heavy grades have to be contended with, from the Canadian Pacific in British Columbia (where the grades average four per cent) to the Guayaquil & Quito Railway in Ecuador (where the grades run as high as seven per cent). They are to be found on the Pacific Coast, in the pine woods of Michigan, and the mining districts of Idaho; the iron and coal regions of western Pennsylvania, and taking part in the development of the New South bordering on the Gulf of Mexico. This useful engine is made by the Lima Locomotive Works at Lima, Ohio. The firm is celebrated for the splendid specimens of direct connected locomotives which they have produced, but to the mining world they are best known for the Shay type of engine.

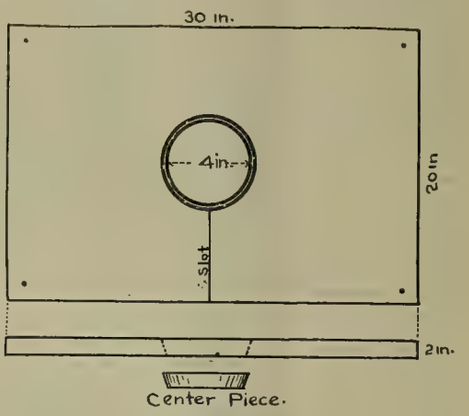


Fig. 1.

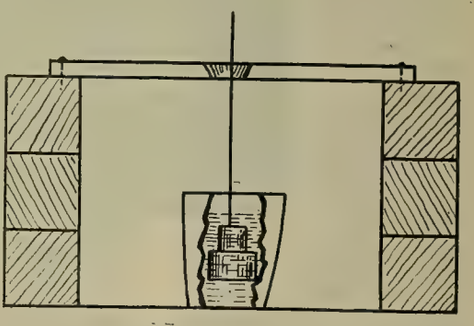


Fig. 2.

The Prospecting and Valuing of Dredging Ground.

Written for the MINING AND SCIENTIFIC PRESS by NORMAN C. STINES.

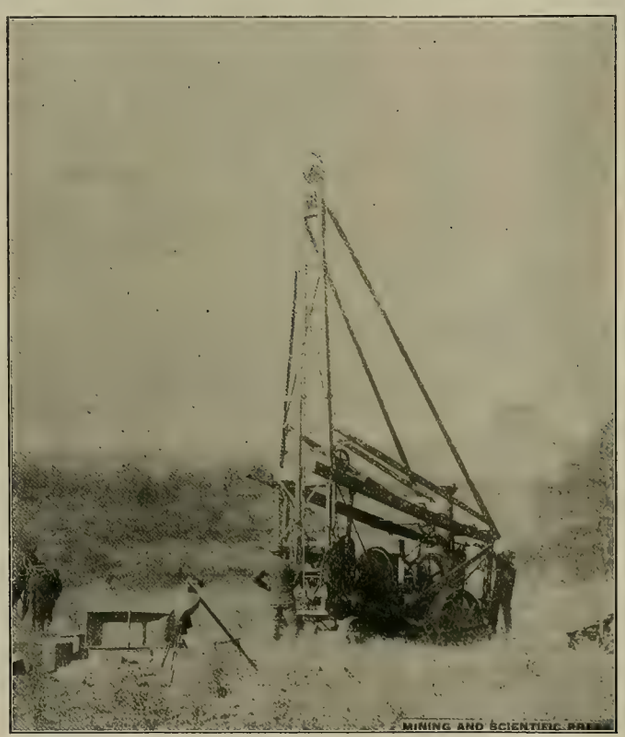
The prospecting of gravel deposits to test their fitness for dredging purposes is done by boring holes with a drilling machine, by sinking shafts, or by making a trial run with what is known as a prospecting dredge. It is such work by means of the Keystone drill that this article attempts to describe.

In prospecting a piece of ground the following data must be ascertained:

1. The average value of the ground per cubic yard and the distribution of the gold.
2. The character of the gravel.
3. The character of the bedrock and its approximate contour.
4. The position of the water level as referred to the surface.
5. The amount of water obtainable for the pond.
6. The nature and cost of the power obtainable.
7. The length of the working season.
8. The cost of the land.

The first four points are determined directly by the use of the drill, and the last four by a careful study of the prevailing conditions. As this paper is to describe the method of using the drill and the interpretation of the results thus obtained, it will treat of the first four points only.

The machine used in the greater part of this work in California is the Keystone Driller No. 3, Traction. It is made by the Keystone Driller Co., Beaver Falls, Pa., and costs complete, f. o. b., at the factory, about $1,630. The driller consists of a walking-beam arrangement operated by a steam engine of 8 h. p. This produces the required motion for raising and dropping the drill, and for transporting it from place to place. The engine, with the drilling cable reel, the sand-reel and the necessary sheaves, is mounted on a four-wheeled truck. The drill, consisting of rope socket, drill-stem and bit, is suspended by a 1¼-in. cable which passes over the rear sheave and over the front one, continuing over the sheave at the top of the derrick and then down. As the walking beams are put in motion, the drill is alternately raised and dropped. The machine makes about 52 strokes per minute in drilling and about 54 in driving.



Moving to a Hole.

Laying Off the Ground.—For the preliminary work, to determine if the gold is scattered over a large area or if it is confined to a narrow winding channel, a few holes are sunk from 500 to 700 ft. apart. If the gold is found to be pretty evenly distributed over the whole tract, it is divided into five or ten-acre squares, according to the amount of drilling to be done. A flag is placed in the center of each of these squares, and this marks the site of the hole.

If the gold is found to be confined to a narrow winding channel the ground is crossed, at right angles to the channel, by series of holes. These series are from 400 to 800 ft. apart. At every 100 ft. in each series a flag is placed and this, as before, marks the place to be drilled. On drilling, the first hole in any series is placed as near the center of the channel as possible, and then drilling to one side or the other is only carried as far as the results warrant. Every fourth or fifth series is drilled across the tract to be sure that there are no splits in the channel. This method insures the least amount of work spent in valueless ground. The series are designated by a letter and the holes by a number. In this way they are recorded in the transit notes. When a hole is drilled, the number in the log-book is also placed in the transit book and the number from the transit book is placed in the log-book.

Operation of Drilling the Hole.—The machine is moved to one of the flags and set up there. A hole is then dug to a couple of feet and the shoe-joint is dropped, then plumbed, and finally the dirt filled around it. The next operation varies according to the nature of the ground. Where the soil is deep, the driving blocks are put on and the casing is driven as far as possible or to the gravel. Where the gravel commences at the surface, the drill is first lowered and the ground immediately beneath the shoe is drilled. The casing generally settles as the drilling proceeds; but if it does not, when a sufficient depth has been drilled, the blocks are put on and the casing driven to a point about three inches below the depth drilled. The lower end of the shoe-joint is protected from injury by a steel shoe, 7½ in. diam., tempered at the cutting edge and slightly beveled on the inside. It is the area of this shoe which represents the area excavated.

The casing is nearly always driven to gravel. If the first joint does not reach, a second, and sometimes a third, is put on. As soon as the first joint has been driven to head, the driving cap is removed, the threads brushed off and greased. The second joint is then put on, cinched tight, the driving cap placed on that and the driving continued. The depth driven at first usually varies from three to twelve feet.

In driving, the stem on which the driving blocks have been placed acts as the weight in a pile-driver. The weight of the stem is about 800 lb. and the drop ranges from 28 to 36 inches.

After the casing has been driven as far as desired, the driving blocks are removed, the stem is lowered into the casing, the core is measured, water is poured in and the walking beams are set in motion. When the machine man measures and reports the length of core to the panner, he also reports the depth of the casing in the ground. The core is measured in the following manner: The length of connected casing is measured on the drill-stem and rope, commencing at the bit. This point is marked in chalk. The stem is then lowered into the hole and the difference between where the top of the casing is and the mark on the stem, is the core. The core then is the material in the casing. This is important and will be fully explained later.

While there is yet some core in the casing, the drill-stem is removed and the sand-pump is placed in the hole. This is a piece of 4-in. pipe about 8 ft. long, in which is a rod or plunger that fits closely the pipe at its lower end, where there is a valve. On raising the plunger suddenly, a vacuum is formed and the material in the hole is forced in through the valve at the bottom. This is repeated until all of the material is thought to be in the pump. The pump is then reeled out of the hole, the contents of which are caught by the panner. The stem is then lowered into the casing, the core is measured, the stem is hoisted, the driving blocks are put on and the casing is driven again.

This is repeated for each foot of the hole until the desired depth has been reached. The desired depth is generally bedrock or the lower limit of a known pay-streak. The depth to which the hole is sunk in bedrock depends upon the occurrence of gold. Some bedrock carries gold for a considerable depth. The hole is generally put down until no colors are found in the pan. It may happen that the casing has come on bedrock in such a way as to cross a seam. This seam may be particularly rich and gold might come into a number of pans after bedrock has been reached. When this occurs, it is well to be wary of the results of that hole, if it gives a yield above the general average. The gold is plainly coming from a seam and so we have no measure of the volume of dirt from which it is coming. There is one way to guard against this danger. When approaching bedrock use two or more small pans for receiving the concentrate from each foot panned. The concentrate for, say, the first 27 ft. is placed in a pan. On driving the 28th foot and panning, there is found to be more gold than usually comes with bedrock. This is then put in a separate small pan, as is each succeeding pan of concentrate; if there seems to be more gold than usual, it is saved separately and the results of the ground above bedrock and that below bedrock are then known. This is not often necessary, but it will save distrust of the high returns, which sometimes appear in a hole among a lot of other lower results, which are fairly close together.

The hole being drilled as far as desired, the drill is placed on the ground, the rope-socket taken from it and placed on the pipe-jars. These pipes or pulling-jars consist of an iron ram or boss on the end of a stem about four feet long. On this stem is a threaded knocking-head with a square opening through which the stem passes, up and down, in striking the blow. The threaded knocking-head is screwed to the casing and the ram is drawn up so that it will strike against the knocking-head when put in motion by the walking-beams. The walking-beams are then set in motion and the jar of the ram against the pipe causes it to be loosened and to be drawn up. As the pipe comes up, the slack is taken by the runner. When the top joint is removed from the ground, the machine is stopped, the threaded knocking-head is removed and the pipe-jars are pulled from the casing. The top joint is then removed and the operation is repeated for each succeeding joint.

When all of the joints are out of the ground, the drill-stem is again put on the rope-socket, loaded into the bed of the machine, the jacks removed from under the machine, the engine thrown into gear for propelling mechanism and the whole is moved to the next flag.

Treatment of Material from the Hole.—The material brought up by the sand-pump may be treated in different ways. It may be caught in a pan held over the sluice-box, the slime going to the sluice-box; it is then washed in the panning tub. It may be caught in the pan, the slime going to the sluice-box as before, then washed in a rocker, the material caught on the apron being panned separately; or it may be dumped into the sluice-box and all of it swept into the rocker, the concentrate being panned.

The second way seems to answer the purpose best. It gives quickest results and is the easiest for the panner. It uses a minimum of water, and at all times the water in the tub is comparatively clear, thereby preventing the loss of gold unavoidable when panning in thick water.

The apparatus required is a sluice-box about eight feet long and 12 in. square in cross-section, a small rocker, pans and panning tub.

Each foot is pumped and panned; the gold is estimated carefully. The amount is then inserted on the log opposite the foot from which it came. This is more fully explained when describing the log-book. The gold is classed in three sizes, 1, 2 and 3. Number 3 is the finest and consists of all pieces which weigh less than one milligram. Number 2 gold would be any piece weighing one milligram or over, up to four milligrams, and Number 1 is such that any piece weighs over four milligrams.

As mentioned above, the concentrate from each washing is put in a small pan and, when the hole is completed, the gold is amalgamated and put by itself. In special cases we would have more than one 'pill,' as explained already. The gold is separated from the mercury by nitric acid and thoroughly washed, dried, annealed and weighed. If the drying is done in the annealing cup there is no danger of loss due to sputtering, but the addition of a few drops of alcohol to the last wash water, when using the porcelain cups, prevents sputtering. From the weight of gold obtained and the volume of dirt from which it came is figured the value of the ground immediately adjacent to the hole.

Not only the gold obtained from the pannings is recorded, but the character of the gravels. This would include a note on the size of particles and whether there was sand, clay or cementing material present. This is ascertained by a close examination of the screenings, as left in the hopper of the rocker. Then, too, the panner carefully notices his concentrate and records anything of interest, such as the amount of black sand, any gem stones, and the appearance of amalgam. These are all recorded in the log-book, opposite the foot in which they were found.

(To be continued.)

ON THE RAND.—In November, 1905, the latest period for which accurate figures are available, the gold mines of the Transvaal produced 424,757 fine ounces of gold from the milling of 1,012,625 tons. The average yield was 35.06s., or $8.41 per ton. The average duty per stamp was 5.05 tons. There were 47,218 Chinese and 80,954 Kaffirs employed at the mines at the end of December.

IF the elements were not eternal in the past, we must ask whether there is reason to believe that they will be eternal in the future. Now although the conception of the decay of an element and its spontaneous transmutation into another element would have seemed absolutely repugnant to the chemist until recently, yet analogy with other moving systems seems to suggest that the elements are not eternal.

Filter-Press Practice in Western Australia.

Written for the MINING AND SCIENTIFIC PRESS by A. B. WALLACE.

When the mine operators in Western Australia turned their attention to the treatment of the gold-bearing slime, they had a choice of one of two methods, namely, decantation and filter-pressing. The serious difficulty was, and is, the scarcity and cost of water. At most mines at that time the water used for milling was the salt water which was pumped out of the mines or from wells. For boiler purposes, this water had to be distilled and cost from $1.25 to $2.50 per hundred gallons. At the present time, however, Kalgoorlie is amply supplied with fresh water by the 'Coolgardie Water Scheme,' as it is called, which supplies about 5,000,000 gal. per day. This water is pumped through a 30-in. main from the Swan river, a distance of 300 miles, and is sold for about 50c. per thousand gallons, meter measure. But in other districts beyond Kalgoorlie, as, for instance, at Menzies, many mines have had to pay as high as $5 per thousand gallons of salt water. For this reason, decantation methods, which involved the loss of, on an average, from 300 to 500 gal., or one or two tons of water per ton of dry slime treated, proved too costly, and, in those localities, filter-pressing was almost universally adopted as the only possible method of slime treatment.

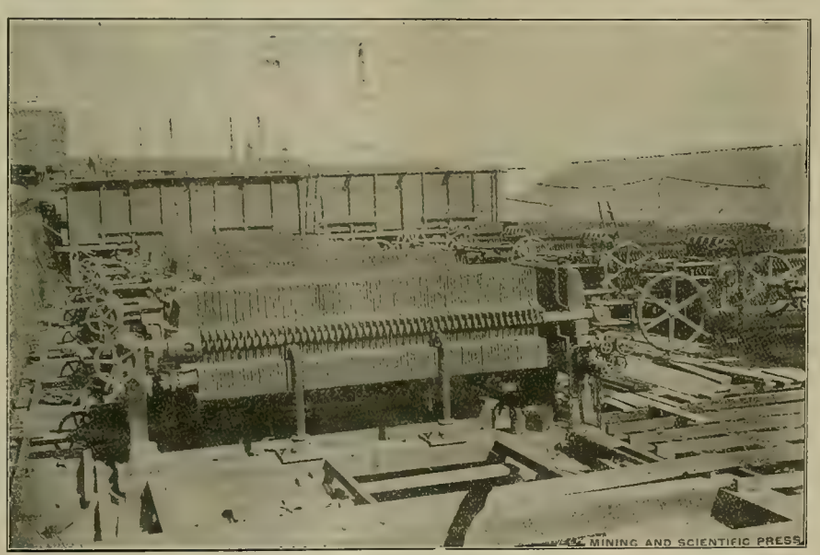
Kalgoorlie in 1897.

The Dehne press or one of similar type is almost universally used. The presses are supplied with feed and wash channels through lugs attached to, but out side of, the frame. At first it was the practice to collect the water from the mill after separating the sand and allow the slime to settle, drawing off the clear water to be returned to the mill. The slimy pulp, in the proportion of about three of water to one of slime, was then forced into the press by means of compressed air. As soon as the press was full the slime was treated for about four hours by pumping cyanide solution through it. In some cases compressed air also was used to dry the pulp; this method, however, took too much press capacity and was finally abandoned.

The method now used is to collect the slime from the mill and agitate it in a vat with mechanical stirrers, with the requisite cyanide solution, in the proportion of two solution to one slime, until all the gold which can be got into solution is dissolved and then filter-pressed, using the filter-press as a separating machine only.

The presses usually have had a capacity of from three to five tons of dry slime per charge; the thickness of the cakes varies, according to the material, from one inch thick to as much as three inches. The thicker the cake, of course, the more economical the treatment. The size of the cake is usually 40 in. square, there being from 30 to 50 cakes in each press. The filter-cloth is material specially woven for that purpose and costs about 50c. per yard at wholesale, so that each cloth costs about $1.25, and it has a life of from 30 to 90 days. If the material pressed contains much sand, the cloth is liable to get cut much quicker. One of the advantages of filter-pressing is the large proportion of dissolved gold and silver which can be recovered. When the pulp is pumped or forced into the press, practically 70% of the solution is recovered at once, then a weak wash or water is forced through the cakes. This washing is very thorough, as the water passes horizontally through the slime from one filter-plate to the other, only about two tons of water being necessary to wash one charge of three and one-half tons of slime. Compressed air is then introduced under about 90 lb. pressure, which forces out more of the remaining water so that the slime, when the treatment is completed, carries only a comparatively small proportion of moisture. That percentage of moisture varies. At the Lady Stenton mine, at Menzies, we often had a residue containing as little as from 11 to 15% moisture, but I consider that the average all over the country would be about 21 per cent.

Regarding the cost of treatment, this varies so largely in different districts that it is practically impossible to give an accurate average. In Western Australia it may be said to vary from $1.50 to nearly $4 per ton of slime, depending on the nature of the material, on local conditions and on the time occupied by one complete cycle of operations. The last is an important factor, and it may be of interest to give a few figures. First, with reference to the labor necessary. It requires two men to discharge a press independent of the 'truckers,' who convey the residue to the dump. These two men can usually discharge a press, clean the frames and close the press ready for another charge in from 30 to 45 minutes. As a rule two men are employed for each pair of presses, discharging and cleaning one while the other is being filled and dried. In some mills, where it takes longer to perform a cycle of operations, two men can handle three presses. On large plants, the shift-boss attends to the filling and washing, but on smaller ones this is also done by the pressmen, who receive about $2.80 per shift of eight hours. The time occupied in filling a press depends on the material and on the pressure used. As a rule, the pulp is forced under a pressure of from 60 to 100 lb. per sq. in. and the press is filled in from 20 to 30 minutes. Wash-water is then used for from 15 to 25 minutes, and generally compressed air to dry the slime is admitted for about 10 minutes; the full cycle of operations, including the discharging and cleaning, being completed in about two hours. Thus, at Menzies, two men, using two presses, handle seven charges in an eight-hour shift, or about 27 short tons of dry slime.



Filter-Presses at Lake View Consols Mine.

The heavy labor cost is due chiefly to the difficulty of getting rid of the residues; these are taken away in cars and frequently have to be hauled some distance over the flat site on which the mill is necessarily erected in a flat desert country. Power is also an expensive item when fuel costs from $6 to $7.50 per cord, and water for boilers has to be distilled or bought. On the other hand, the method could be used economically in a district where there was a plentiful supply of water, as the residues could be sluiced away and water could be used to supply power both for agitation and for compressing air.

Of late it has been the custom to use pumps for filling the presses instead of compressed air, as being cheaper, but when this is done, a large air-chamber must be added to produce as steady a pressure as possible.

The Diehl process, which involves the sliming of all the ore, has been employed with great success at some of the large properties. This described briefly is as follows: The ore, after crushing and amalgamating, is sized, the fine slime going direct to the agitation vats, and the coarse sand going to flint or tube-mills for re-grinding. The product from these is again sized and the coarse material returned, the fine going, as before, to the agitation vats, which only receive the ore after it is ground to slime. It is then agitated with cyanide solution for a period varying from 16 to 24 hours, then a solution of bromo-cyanide is added and the agitation continued for a further period, after which the whole is filter-pressed. This method, on the whole, has been highly successful in Western Australia and owing to the peculiar local conditions, was the only one possible. In many cases, slime has been treated which had accumulated in the settling dams. This is taken in cars to a 'mixer,' in which the slime is thoroughly broken up in cyanide solution, after which the treatment, of course, is the same as previously described.

THE BORAX INDUSTRY.—Almost the entire production of borax in the United States continues to come from California—from San Bernardino, Ventura and Inyo counties—although surface deposits in Nevada, near the California line, now produce a small quantity. The colemanite deposits in San Bernardino county, Cal., are the largest producers, and the deposit owned by the Borax Consolidated Company, Ltd. (Pacific Coast Borax Company), is the greatest of these. The American Borax Company, in San Bernardino county, is the second producer in importance. This company is working a low-grade borate of lime, from which boric acid is produced by a special process. The Western Mining Company, which began operations near the end of 1905, is working the same class of material. The Palm Borate Company also owns properties in the neighborhood of Daggett. In Ventura county the Frazier Borate Company is mining material which is shipped to San Francisco and refined by the Stauffer Chemical Company. The Columbus Borax Company is also operating a deposit in the same county. Near Big Pine, Inyo county, the Western Borax Company is working marsh dirt or mud that carries from 8 to 10% of borax. The output of Inyo county is limited by reason of the difficulties of transport and the scarcity of white labor. Along the Mohave desert and the Death Valley region of California are numerous small deposits of low-grade borax, which will doubtless be utilized in the future. There are several places in Nevada where the 'cotton ball' surface deposits are being worked; this is a venture that would have been wholly profitless before the increase of the tariff on borax. Near Winnemucca, Nev., there are two surface deposits of earth overlying old marshes and carrying about 15% of borax, which are worked during the summer. The bulk of the borax of this country comes from the colemanite mine of the Pacific Coast Borax Company at Borate, San Bernardino county. All the ore that averages 35% or more is shipped East directly, but the lower grades are first concentrated at Marion. This company is now manufacturing at its Eastern refinery several new products, such as borax soap, talcum powder, bath powder, etc., which, having been well advertised, are popular and have caused an increased consumption of borax in the household. The Pacific Coast Borax Company also owns certain borax properties in Nevada, including Teels' Marsh, where Mr. F. M. Smith, president of the company, first discovered borax. This particular deposit is now nearly worked out. Among other properties owned by the company are several in and around Death Valley, which have not yet been worked.—Charles G. Yale in *Mineral Resources*.

Cyanidation of Concentrate.

Written for the MINING AND SCIENTIFIC PRESS by FRANCIS J. HOBSON.

It is generally held that gold as it exists in concentrates, is soluble in potassium cyanide, and the adaptability of the cyanide process depends entirely upon the physical characteristics of the concentrate to be treated, the relative association of the crystalline particles; provided, there are no base metals present to cause an excessive consumption of cyanide and consequent fouling of solutions.

In the case of silver, the question arises as to the solubility of the various natural occurrences of the metal as well as the physical and chemical characteristics of the concentrate.

The chief minerals of silver are: The native metal and the sulphide, argentite; four species among the sulph-arsenites and sulph-antimonites, namely, proustite, or ruby silver; pyrargyrite, dark red silver; freieslebenite, antimonial silver-lead sulphide; stephanite or brittle silver; the bromide and chlorobromide, bromyrite and embolite. Argentiferous tetrahedrite contains sometimes as high as 30 per cent silver as argentite; there is also argentiferous galenite and blende containing silver as sulphide.

The first mentioned, native silver, is so slowly soluble in cyanide that from it practically no extraction can be obtained. Argentite is readily soluble, likewise the chloride, bromide and chloro-bromide. Ruby silver, stephanite, and freieslebenite, are sparingly soluble in cyanide solutions, but they are readily soluble in a solution of mercurous potassic cyanide. The extraction of silver by cyanide from argentiferous galenite, is a problem yet to be solved.

Taking these facts as a basis, in the absence of chemical interference, silver can be extracted from concentrates where it exists in soluble form, if the physical structure permits of solution-contact with the contained argentiferous compound. I have proved in the case of concentrates from Veta Madre ore, that the physical structure will permit contact sufficient for the extraction of both silver and gold without the fouling of solutions. I leached 100 lb. of concentrate obtained from ore crushed by stamps to pass a 30-mesh screen. This material was treated continuously for 90 days with 0.3 per cent KCy solution. An extraction of 89 per cent of the silver and 97 per cent of the gold was obtained, an extraction of 91.5 per cent of the total value. The metals were precipitated on zinc shaving in a porcelain zinc-box; the clean-up checked with the extractions called for by assay; all of the zinc was reduced with acid.

One hundred pounds of concentrate, re-ground to pass a 100-mesh screen, were treated by agitation in a revolving barrel with a 0.3 per cent cyanide solution, for eight days, decanting and renewing solution daily. The extraction obtained was 93.5 per cent of the silver and 96 of the gold. I believe that 30 days' leaching of the re-ground concentrate would have given an equally good result. The cyanide consumption in both tests was seven kilograms per ton. The concentrate was low grade, assaying about four kilograms silver and 30 grams gold per metric ton.

I am now running a test in my laboratory on a 100-kilo. charge of concentrate, assaying 26.5 kilo. silver and 130 grams gold. Silver exists in the concentrate chiefly as argentite. It is being leached with 0.7 per cent solution. So far it does not show an excessive consumption of cyanide, and after seven days' leaching the extraction of silver was about 20 per cent. After leaching for six weeks, the extraction is 53 per cent of the silver and 80 per cent of the gold. Leaching is still going on. Comparing this result with that obtained in the same time in the 90 days' leach, I expect a like extraction with three months' leaching. At first this may seem to be an exceedingly long time of treatment, but when you consider that from ores in this camp, less than one per cent of concentrate by weight of ore is obtained, a small addition to our cyanide mills will take care of our concentrate output. In the case of the Guanajuato Mines & Reduction Company's plant, we are erecting sand-vats each of 350-tons capacity. Two additional vats will handle concentrate, although it will doubtless be better to put in three vats one half the size of our sand-vats. This will allow for six weeks' collecting of concentrate and three months' leaching. The sand mill-solution can be used for this purpose without interference with sand treatment. The precipitation can take place in the sand-solution zinc-boxes.

I am of the opinion that concentrate from other ores of the Guanajuato district will be less amenable to cyanide treatment than those from the Veta Madre, as considerable value is carried in arsenopyrite whose molecular structure is more compact than that of the pyrite; consequently, if the extraction can be obtained, it will be by longer contact, as a more compact structure will necessarily cause slower diffusion of solution.

The best method of treating our concentrates is likely to be by leaching with cyanide solution for periods of from 30 to 180 days, followed by chloridizing roast and further leaching with cyanide. The objection will be made that returns of bullion from the concentrate-leaching will be greatly delayed, but it will not be as long as the length of treatment suggests, because the larger part of the extraction will be obtained in the earlier period of leaching, and this bullion will be recovered as it is extracted, in the regular clean-up.

Hoist Underground.

On the page opposite we give a drawing of the arrangement of hoist, ore-bins and station at the main, or Principe, shaft of the Sirena mine, which is the property of the Guanajuato Consolidated Mining & Milling Company, at Guanajuato, Mexico. The plant includes a crusher, into which the ore passes, after preliminary sizing over grizzlies. There are separate bins for the coarse and the fine; also pockets for the waste rock, which is used as filling for old stopes. The ore is hoisted in skips running on an incline of 45°. We owe this drawing to the courtesy of the manager, Mr. M. E. MacDonald.

Cantilever Over the Zambesi.

The large cantilever bridge over the Zambesi river near the great Victoria Falls, in Africa, forms a part of the permanent way of the Cape-to-Cairo Railway, which is to connect Egypt with South Africa. At the point where the bridge crosses the Zambesi river is a gorge 420 ft. high. and the bridge crosses the top of the gorge almost on a level with the top of the Victoria Falls. Communication between the two banks of the gorge was first established by means of a line rocket fired from one bank to the other, and by drawing over ropes of gradually increasing sizes. The two sides were eventually connected by means of a cable 2.7 in. thick, and upon this a Blondin transporter was operated. This transporter was able to carry a load of 10 tons, and within a few weeks over 1,000 tons of material for the bridge and roadway, as well as locomotives and trucks, in pieces, were conveyed across the gorge. The bridge had to be erected on the cantilever principle, each side being made self-supporting, and the two sides gradually approached each other until they were finally connected at the center. The total length of the bridge is 650 ft., of which the central span includes 500 ft. This central span is made of 20 bays, each 25 ft. long. It will be seen from this that, during its erection, there was an overhang on each side of 250 ft. before the bridge could be connected. To counteract this weight of several hundred tons on the overhanging ends, a cable was made fast to each of the unfinished sections, and was carried upward to the shore ends, where it was anchored to the bank. All the riveting, lighting, and transporting were done by electricity. During a considerable portion of the year the bridge is surrounded by a cloud of mist from the falls, and this makes its protection from rust a problem of great importance. During the erection of the bridge every piece was carefully inspected, all signs of rust were removed, and a special coating of waterproof paint was used. The finishing coat of the bridge will be of a dull gray enamel. —*Technical World.*

SPECULATION AND PROSPERITY.—Prof. Bryce, who looks indulgently at what are sometimes called the foibles of Americans, regards their habit of rushing into wild speculation as only one phase of their abundant belief in the country's future. Just how much of it is really this, and how much the attribute of character which makes our men the first poker-players, and our women the foremost bridge experts in the world, would perhaps be difficult to say. But they certainly delight in the one for its own sake as they do in the other; the difference being that the argument of a 'discounted future' gives a sort of moral status to speculation for the rise on a narrow margin, and stamps the unbeliever in the market as a doubter of his own country's greatness. And, after all, whatever our feeling may be about Wall Street's way of voicing its sentiments, it is a notable picture of robust prosperity which the country spreads before us. Certainly, not since 1900 has there been a season when the era of good times existed visibly in every city and village of the United States as it exists today. This prosperity is real as it was not, in such familiar 'boom times' as 1872 and 1856, when the excitement of the markets had its origin in the paper-money manufactories rather than in the products of the earth. It is this fact which leads to the comfortable belief that prosperity will last for a good while after the speculation which professes to 'discount' it has tampered with the money market and met its inevitable collapse.—*Evening Post*, New York.

Now is the time to engage contractors to dismantle old mills at low cost. This work should be in great demand, as a report is going the rounds of the daily press to the effect that certain contractors who were dismantling an old mill near Albuquerque, New Mexico, discovered a $200,000 gold brick under the floor. Newspapers often sell gold bricks.

Air Compressors at the Champion Copper Mine, Michigan.

Among the 22 productive mines of the Lake Superior region the Champion ranked fifth in production in 1905, being credited with an output of 16,750,000 lb. refined copper, the sale of which yielded dividends of $1,500,000. The mine is at Painesdale, Michigan, and is one of the properties operated by the Copper Range Consolidated Copper Company. Under average conditions its output is about 2,000 tons of ore per day, which is hoisted through four shafts.

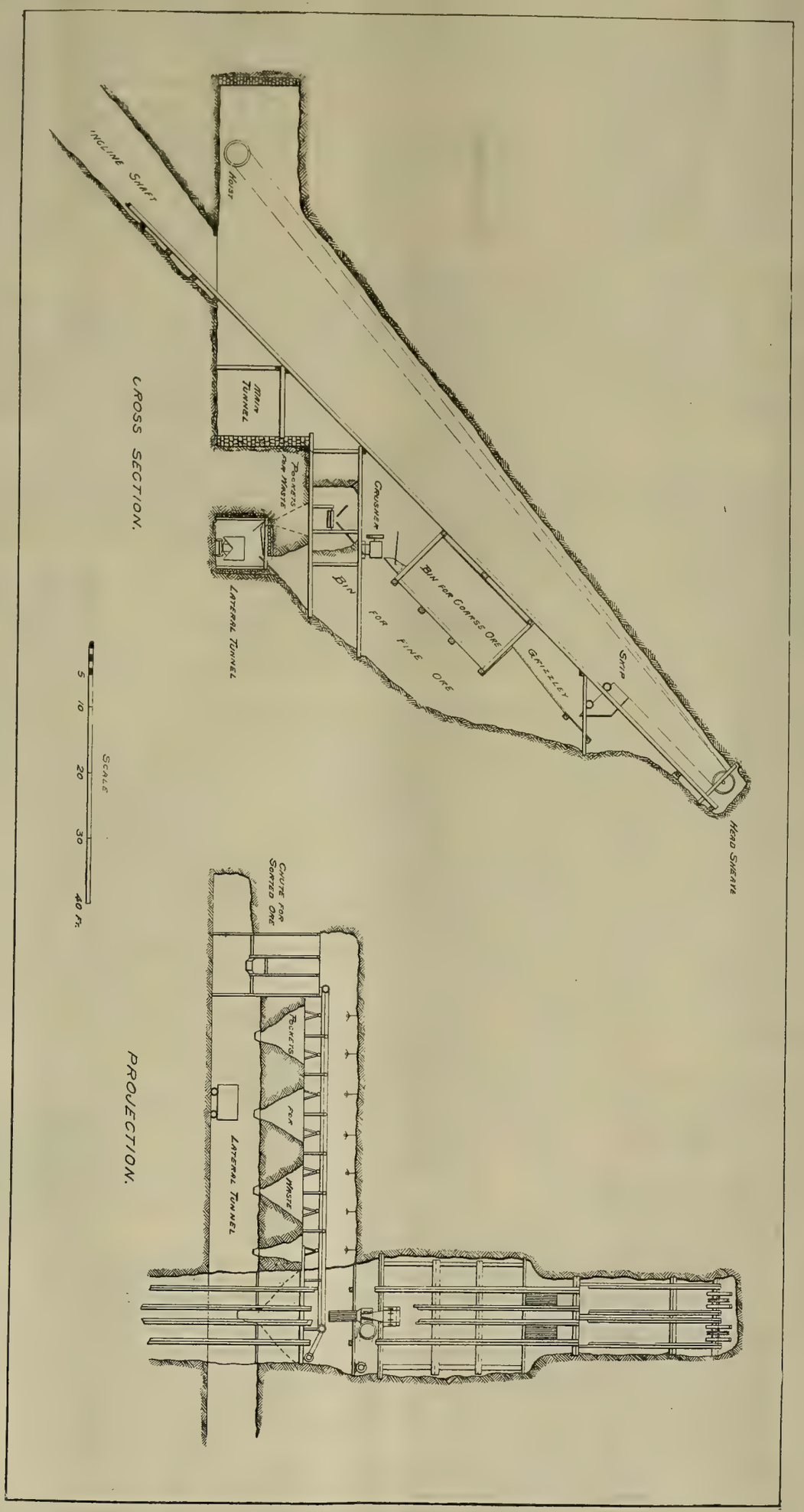
The best machinery is to be found at the Michigan copper mines, and the Champion is no exception. It has one of the largest compressors in the district. This was built by the Ingersoll-Sergeant Company, of New York. It is a duplex Corliss type, with cross-compound condensing steam cylinders and two-stage air cylinders. Steam is supplied at 130-lb. pressure by a battery of high-pressure boilers in an adjacent boiler-house. The steam pipe enters the basement of the compressor-house and rises through the engine-room floor to the high-pressure steam-cylinder with a wide sweep bend of 6-in. pipe. The exhaust passes to a Worthington condenser placed, with its pumps, in the basement below. A 20-in. vacuum is maintained. The steam valve-gear is of standard Corliss release type. Automatic regulation is secured by an improved governor, in which the usual fly-balls are supplemented by a governor cylinder, through which receiver air-pressure operates to vary the cut-off on both cylinders, adjusting the speed to the demand for air and maintaining air-pressure constant. Main frames are of standard heavy-duty Tangye pattern, and cranks are of balanced disk type.

High and low pressure air-cylinders are completely water-jacketed on heads and barrels. Cold air is drawn from outside the building through a duct terminating in an intake bracket supported on the compressor foundation. The Sergeant piston-inlet valve handles the intake on both high and low pressure cylinders. Direct-lift discharge valves are used. A vertical receiver-intercooler stands between the cylinders, 48 in. diam. and 13½ ft. high, with tinned brass tubes, through which the cooling water circulates. Steam-cylinders are 18 and 36 in. diam.; air-cylinders 20¾ and 32¼ in. The stroke is 48 in. Normal speed is 72 r.p.m., at which the free-air capacity of the compressor is 3,100 cu. ft. per minute. Air-pressure is 80 pounds.

The compressor building is an iron-covered, steel-framed structure, lined with sheathing and floored with matched wood. A solid concrete foundation, capped with finished stone, supports the compressor. In a separate building close at hand is another Ingersoll-Sergeant air compressor—a survivor from early days. At one time this small machine furnished all the air required for rock-drills; today it is maintained as an auxiliary to the larger compressor. It is a straight-line type, steam-driven, with simple steam and air cylinders 18 and 18¼ in. diam., respectively, and a stroke of 24 in. At the rated speed of 94 r.p.m. its free-air capacity is 656 cu. ft. per minute, delivered at 80-lb. pressure. The steam end is fitted with adjustable cut-off valves of Meyer type, and Sergeant piston-inlet and direct-lift discharge valves handle admission and discharge of the air.

There was a period of two years in the history of the Champion mine when rapid development threw an unusually heavy load on these two compressors, the Corliss and straight-line. During this time these machines ran continuously, carrying jointly an average load of 56 rock-drills, 7 pumps and 4 small hoists used for light work. Throughout all this heavy overload there were no breakages and no repairs on the compressors, nor any delay directly chargeable to these machines. They came through the ordeal in splendid condition. Now that conditions are somewhat relieved, the larger compressor easily does the work of its part of the mine, while its smaller associate stands ready for emergencies.

MAGNETIC WELLS.—The term 'magnetic wells' has been applied to wells whose casings attract and hold iron objects. In the study of underground waters much interesting information concerning these magnetic wells has been obtained by members of the United States Geological Survey. Usually only small objects, such as nails, are attracted by the casings, but occasionally a well is found in which the magnetism is sufficient to hold hammers or wrenches. The water in the wells is sometimes reported to be magnetic. To make a test for magnetism in water, a glass vessel (a metal vessel will not answer) should be filled at the well and carried to a distance of about 100 paces from the well, where it should be at least equally remote from any mass of iron. A piece of steel, such as a pocket knife, should then be carefully tested with some common needles for magnetism. If the steel is not magnetized it should then be placed immediately in the water in the glass vessel and allowed to remain there for five minutes, after which it should be wiped dry and again tested.



ARRANGEMENT FOR HOISTING UNDERGROUND IN THE SIRENA MINE, OF THE GUANAJUATO CONSOLIDATED MINING & MILLING COMPANY.

The Separation of Iron From Zinc by Ammonia.

Written for the MINING AND SCIENTIFIC PRESS by KURT PIETRUSKY.

The ordinary method of separating iron from zinc, manganese, nickel and cobalt usually employed for qualitative analyses consists in treating a ferri-solution with ammonia. This method, in its simple form, does not give satisfactory results for quantitative analyses, as the precipitate will always contain a certain amount of the other metals present. Thus, Fraatz has found that, if the ferri-solution contains more zinc than iron, a quantity of zinc amounting to about one-fifth of the weight of the iron present will remain, and this cannot be washed out of the precipitate.

Ibbotson and Brearley employed the same method for separating iron from nickel, but obtained in the filtrate of a single precipitation only from 3 to 30% of the total amount of nickel, the quantity depending upon the excess of ammonia in the solution. By addition of large amounts of ammonia and chloride of ammonium, they succeeded in affecting a complete separation, but this procedure is hardly advisable for practical analytical work. The only way of using the ammonia method in regard to zinc and nickel would be to repeat the operations, that is, dissolving the iron hydroxide precipitate and precipitating the iron until the ammoniacal filtrate contains no other metal but iron.

For the separation of iron from cobalt and especially from manganese, the ammonia method is hardly ever used on account of the highly oxidizable character of the protoxides of the metals. The only way to use the ammonia method in a practical way seems to consist in the separation of iron from zinc after the assay method of Schaffner and Galletti.

In order to finally settle the question whether a complete separation of iron from zinc is possible by precipitation with ammonia and ammonium chloride in a single operation, and, if so, under what conditions this result can be accomplished, W. Funk has recently made a number of interesting tests in the laboratory of the Royal Mining Academy at Freiberg in Saxony which had been suggested to him by Professor O. Brunck of that institution. He reports on the results of his investigation in the *Zeitschrift für Angewandte Chemie*, as follows:

The test solutions contained zinc chloride and iron chloride respectively. The former ore was obtained by dissolving electrolytic zinc in an insufficient amount of hydrochloric acid and filtering the residue; 1 c.c. of the solution contained 0.005212 gram of zinc. The ferri-solution was obtained by dissolving electrolytically separated iron in hydrochloric acid and oxidizing the protochloride solution; 1 c.c. contained 0.004056 gram of iron. The contents in each case were determined by gravimetric analysis.

Measured volumes of these metallic solutions were placed in a vessel and diluted to various degrees of strength, whereupon various quantities of ammonium chloride and ammonia of 10% strength were added. The mixtures were heated between 70 and 80° C., and filtered. The precipitate was washed with hot water, either pure or containing ammonium chloride, and dissolved in a little hydrochloric acid, whereupon the iron was once more precipitated, washed and dissolved. The zinc remaining in the iron hydroxide after the second precipitation, was precipitated by treating it with hydrogen di-sulphide in a formic acid solution, and determined by weight as sulphide of zinc.

The first two tests gave the following results:

1. Applied: 208.4 mg. zinc, 60.8 mg. iron; added, one gram ammonium chloride and 3 c.c. of ammonia (of 10%); total volume, 155 c.c. The determination of zinc in the precipitated iron hydroxide yielded 69.2 mg. zinc sulphide, which is equal to 46.4 mg. zinc or 22.3% of the amount applied.

2. Applied: 208.4 mg. zinc, 202.9 mg. iron; added, two grams ammonium chloride and 5 c.c. ammonia; total volume, 260 c.c.; contents of iron hydroxide: 182.2 mg. zinc sulphide, equal to 122.3 mg. zinc or 58.7% of the amount applied.

These results show that it is impossible, even by double precipitation and addition of sufficient amounts of ammonium chloride, to achieve complete separation, if the precipitation is carried out with only a small excess of ammonia.

In the succeeding tests the amount of ammonia added was, therefore, increased, and at the same time other conditions were changed. For tests No. 3 and 4 pure hot water was used for washing the precipitate, while for test No. 5, 6 and 7 a 1% solution and for the other tests a 5% solution of ammonium chloride was applied for this purpose. The results are given in the table at the top of the next column:

The conclusions to be drawn from these figures are: Iron may be separated from zinc by double precipitation with ammonia. A satisfactory result, however, can be obtained only if there is a large excess of ammonia in the solution. Beside, the presence of ammonium chloride is necessary; this salt has to be added also to the wash water, the quantity required amounting to about 5%. The filtrates of tests No. 3 and 4 where the washing was done with pure water

Test Number.	Applied.		Added.		Total Volume c.c.	Contents of the Precipitate, $Fe(OH)_3$.		
	Zn, milligrams	Fe, milligrams	NH_4Cl, grams	NH_3, c.c.		ZnS, milligrams	Zn, milligrams	Per Cent of applied Zn
3	261.6	81.1	0.3	25	245	30.0	20.1	7.7
4	156.3	81.1	0.8	20	85	7.1	4 8	3 1
5	208 4	40.6	1	10	115	9.6	6.4	3.1
6	208 4	60.8	1	25	185	6.5	4 4	2.1
7	260 6	81 1	1	30	125	1.6	1.1	0.4
8	130 3	81.1	1	15	75	1.5	1.0	0 8
9	130.3	81.1	1	20	80	0.2	0 1	0.1
10	260 6	81.1	3	30	245	0 3	0.2	0.1
11	260.6	40.6	1	30	125	0.6	0.4	0.2
12	208.4	81.1	2	30	125	0 3	0.2	0.1
13	104.2	162.2	1	25	105	0.2	0.1	0.1
14	104.2	202.8	1	30	175	0.3	0.2	0.2

became even turbid when the washing was continued for some time, notwithstanding the large excess of ammonia present on account of the formation of zinc hydroxide. Dilution exercises hardly any influence, as shown by tests No. 6, 7 and 8, and will consequently not be practiced to any further degree than is necessary for the settling of the iron precipitate. The method, when carried out in this manner, will yield accurate results up to 0.1 to 0.2%, even in presence of larger amounts of iron than of zinc. However, in contradiction to the statements made by Pattinson and Redpath, even then traces of zinc could be always found in the iron precipitate.

As indicated by these results, the separation of zinc from iron by ammonia is to be done in the following manner: The slightly sour solution, not unnecessarily dilute, which contains the iron as a ferri-salt, is placed in a bowl. Ammonium chloride and ammonia are added till neutral reaction takes place, when more ammonia is added, until the iron is precipitated. Thereupon an excessive quantity of ammonia is added, the amount varying between 20 and 30 times that required for precipitating the iron and depending upon the quantity of zinc present. The mixture is heated between 70 and 80° C., filtered, and washed with a 5% solution of ammonium chloride. The precipitate is dissolved in diluted hot hydrochloric acid, and the operation is repeated in the same manner.

The zinc contained in the filtrate may be determined by volumetric analysis in the usual manner. The method is, therefore, simple and suitable for technical purposes. If it is desired to determine the iron at the same time, the precipitated iron hydroxide has to be liberated of the ammonium chloride by washing with pure water before the heating and weighing can be done. Considering the large excess of ammonia used for precipitating the iron, it may, however, reasonably be expected that the iron hydroxide will contain determinable quantities of silicic acid. The following tests show that the determination of this acid should not be omitted.

Measured volumes of a solution of iron chloride were treated the same way as above. The iron hydroxide obtained by double precipitation was heated and weighed, whereupon the iron oxide was reduced by continued heating in a current of hydrogen gas, the metallic iron was dissolved, and the residue, consisting of silicic acid, was filtered and weighed; then, in order to exclude error, it was evaporated with a little hydrofluoric acid and two drops of sulphuric acid; the small residue obtained therefrom was deducted. The results of the two tests were as follows:

Test No. 1: 10 c.c. of a solution of iron chloride ($FeCl_3$) equal to 58 mg. ferric oxide (Fe_2O_3) were precipitated with 20 c.c. ammonia; found: 60.1 mg. Fe_2O_3 containing 1.7 mg. silicic acid (SiO_2) equal to 2.9% of the quantity of Fe_2O_3 applied.

Test No. 2: 50 c.c. of a solution of $FeCl_3$ equal to 289.9 mg. of Fe_2O_3 were precipitated by 30 c.c. ammonia; found: 292.9 mg. of Fe_2O_3 containing 2.6 mg. SiO_2 equal to 0.8% of the quantity of Fe_2O_3 applied.

This shows that the silicic acid contained in the weighed iron oxide should not be neglected, and that the quantity of the acid present is dependent upon the amount of ammonia applied.

The results of the investigation justify Funk in stating that the separation of iron from zinc by ammonia is adapted for the volumetric estimation of zinc after the methods of Schaffner or Galletti. It is, however, not advisable to use it for gravimetric analyses, firstly, because the determination of the silicic acid contained in the iron precipitate renders the estimation of this metal more tedious, and furthermore, because the filtrate, on account of the addition of ammonium chloride and washing with water mixed with this salt, will contain considerable amounts of ammonium salts, by which the determination of the metals remaining in the filtrate will be made more difficult.

Mr. Funk concludes his report by saying that also in other respects the separation of iron from zinc by ammonia offers no advantages compared with the acetate method which, when carried out correctly, will yield accurate results in a single operation. As the opinions in regard to accuracy and suitability of this method, as well as the instructions given for using it, differ greatly, Mr. Funk has made also this process the object of a special investigation on the results of which he intends to report later.

THE PROSPECTOR.

The rock and mineral samples from Dulzura, San Diego county, Cal., are: No. 1 is quartz-porphyry, though the quartz blebs are not numerous; the rock contains very finely disseminated pyrite and mispickel (arsenical iron sulphide), and probably will assay in gold. No. 2 is quartz, with micaceous iron. No. 3 consists chiefly of an aggregate of grains of quartz and feldspar, with a few small crystals of pink tourmaline (rubellite); the bright crystals with radiated structure are sillimanite, a composition of silica and alumina. No. 4 is tourmaline. No. 5 is quartz.

The rock samples from Goldfield, Nev., are classified as follows: No. 36, rhyolite. No. 37, a granitic rock in which quartz and feldspars are prominent, and mica or hornblende scarce. No. 38 is andesite. No. 39, mica schist. No. 40 is the same as 37. No. 41 is rhyolite tuff. No. 42 is basalt. No. 43 consists almost wholly of feldspar matrix, with a few small lath-like crystals of plagioclase; it may be called feldspar-porphyry; it contains pyrite, also, in finely disseminated crystals.

The rocks and ores from Dillon, Mont., are as follows: No. 1, magnetite in quartz. No. 2, the yellowish green mineral is clinochlore, a silicate of magnesia, alumina and iron; clinochlore is supposed to be generally the result of decomposition of biotite. No. 3 is wad, an impure mixture of manganese and iron oxide with clay or other earthy mineral. No. 4 is volcanic ash.

The rock sample from Princeton, B. C., marked W. C. M., is a very much kaolinized eruptive rock, the exact nature of which cannot be determined because so much altered.

RADIUM is a metal, extremely like barium, except that its atomic weight is about the sum of those of barium and of strontium, and except that the average life of an atom of radium is only about 2,000 years. It casts off helium, and what is left is a chemically inert gas, somewhat like xenon. The average life of the atom of radium emanation is only five days. It decomposes, and its principal constituent, called Radium A, is left as a deposit on the surface of the vessel. The average life of the atom of Radium A is only 4½ minutes. It is converted by throwing off helium or something like that into a somewhat more volatile element called Radium B, of which the average life is half an hour. Radium B is decomposed in a different way, little studied as yet, into another, less volatile element, Radium C, whose atom has an average life of 40 or 41 minutes. This gives off, not merely such rays as radium itself emits, but, besides others, great penetration, and there is left another element, a little more volatile, called Radium D. The average life of the atom of Radium D is over half a century, and in its decomposition no rays at all are given off, and the non-volatile element, Radium E, remains. This has an average of nearly nine days, and, in decomposing, gives off only the more penetrating rays, none of those by which radium affects the photographic film, and is converted into the first of the new elements discovered by Mme. Curie, polonium, which has an average life of ten months. But we will not pursue these vicissitudes further. Polonium is an element very much like bismuth. Dr. Bollwood holds that all these changes come to an end with the production of lead, but we cannot understand that in an absolute sense; and it is not particularly unlikely that lead should be converted into gold. In fact, the tales of the philosopher's stone and of projection do not seem today half so marvelous as what we may see at any moment by looking into a spintharoscope.

LEAD REFINERIES.—At the present time there are only four large producers of refined lead in the United States, namely, the American Smelting & Refining Company, through itself and its allied interests, the Balbach Smelting & Refining Company, the St. Joseph Lead Company and the St. Louis Smelting & Refining Company, the last being one of the subsidiary companies of the National Lead Company. It is even probable that there will be a further consolidation of interests, since during the latter portion of the year there was a good deal of talk as to the eventual consolidation of the United Lead Company (American Smelting & Refining Company) and the National Lead Company, a combination which has been under consideration for several years.—W. R. Ingalls in *Eng. & Min. Journal*.

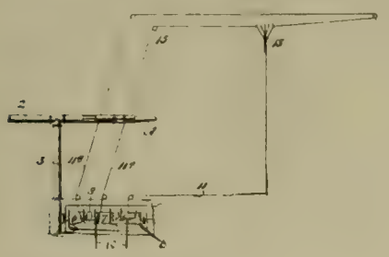
There is good reason to believe that in radium, and in other elements possessing very complex atoms, we do actually observe that break-up and spontaneous re-arrangement which constitute a transmutation of elements.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 16, 1906.

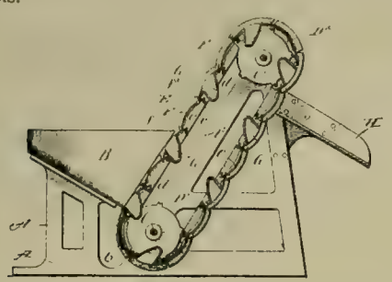
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

DEVICE FOR REMOVING MINING AND OTHER DEBRIS.—No. 809,593; S. W. Wible, Bakersfield, California.



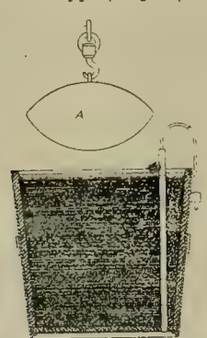
An apparatus for removing rock and debris, comprising drums loosely mounted upon a motor-driven shaft, means for engaging drums with or disengaging them from the shaft, a rake, a rope extending from the rake to one of drums, direction pulleys around which the rope passes, other ropes connecting with opposite sides of the rake, direction-pulleys around which the ropes pass, and independent winding-drums with which ropes are connected and by which the rake is placed in position.

CONVEYER.—No. 809,316; J. W. Mackin, Chicago, Illinois.



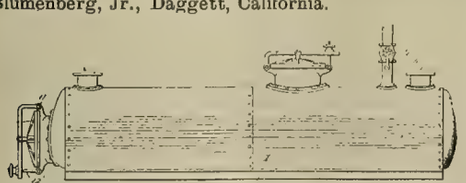
The combination with supporting-frame, of guide-wheels journaled at top and bottom of frame and located out of vertical alinement, an endless conveyer passing around wheels and comprising buckets and intermediate plates having overlapping adjacent edges, tops of buckets being flush with surface of intermediate plates, a supply-hopper the lower edge of which terminates adjacent to conveyer and lies below axis of lower guide-wheels, and a chute supported by frame and located beneath upper guide-wheel.

METHOD OF SKIMMING SLAG FROM MOLTEN METAL.—No. 809,405; M. M. Suppes, Elyria, Ohio.



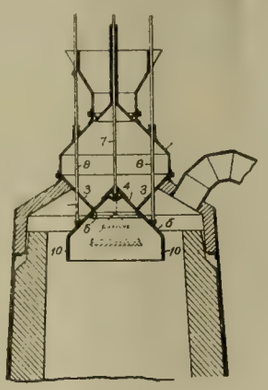
Method of skimming slag from liquid metal, which consists in displacing the slag by the immersion, or partial immersion, therein, of a displacing mass or body, having a specific gravity higher than that of the slag and lower than that of the underlying metal.

PROCESS OF MAKING BORIC ACID.—No. 809,550; H. Blumenberg, Jr., Daggett, California.



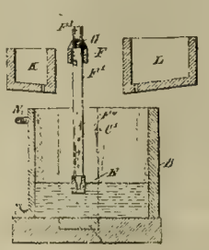
The process of producing boric acid, consisting in generating sulphur dioxide continuously by burning sulphur in a vessel, supplying vessel continuously with air under pressure, introducing sulphur into vessel without interrupting process, temporarily diverting a portion of the sulphur dioxide to the outside atmosphere during the introduction of the sulphur, leading the sulphur-dioxide gas into the presence of ore, which is finely divided and mixed with water in suitable proportions, resulting in decomposing the ore and freeing boric acid, which is taken up by the water in solution, and separating the product by evaporation.

CHARGING APPARATUS FOR BLAST-FURNACES.—No. 809,754; G. C. Shackleford, Allegheny, Pennsylvania



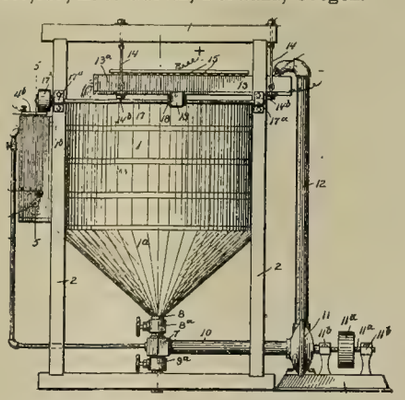
A charging apparatus for blast-furnaces, having in combination a feed-hopper, a distributing-bell arranged below the hopper and having an opening in line with and of a diameter not less than the diameter of the opening in the hopper, means for raising and lowering the distributing-bell, a main bell adapted to close the openings in the hopper and distributing-bell, and movable through the latter to closed or normal position.

PROCESS FOR PRODUCING COMPOUND INGOTS.—No. 809,871; M. Weiss, Philadelphia, Pennsylvania.



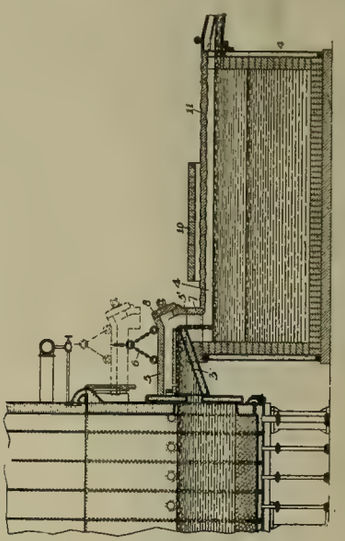
The process of making compound ingots of different materials in different parts, which consists in pouring molten materials of different composition into a mold side by side, and heating the materials at their point of interflowing.

APPARATUS FOR RECOVERING PRECIOUS METALS.—No. 809,939; E. J. Garvin, Portland, Oregon.



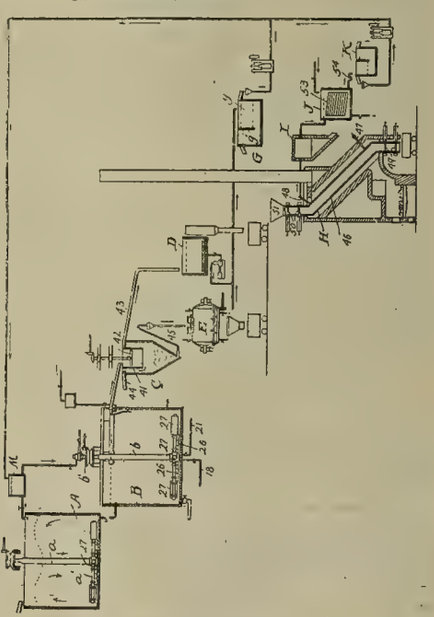
An apparatus comprising in combination a supporting frame, a main tank mounted thereon having conical bottom and valved outlet, a junction member into which valved outlet of the main tank discharges, a valved off-take for junction member, a separating tank mounted on supporting frame and having an inlet in communication with the main tank near its top and an outlet at a point below its inlet, separating tank having its sides provided with a plurality of grooves, a plurality of metal plates held in grooves and forming anodes, a cathode mounted in separating tank below anodes, cathode comprising a cylindrical member consisting of end disks, metallic strips connecting end disks together, cathode being rotatably mounted in separating tank, separating tank having a concaved bottom adapted to receive mercury to cover the lower portions of cathode, a valved pipe connection communicating with junction member and the outlet of separating tank, an amalgamating tank loosely mounted on supporting frame above main tank and having a discharge outlet adapted to discharge into main tank, amalgamating tank having its sides provided with grooves, a plurality of metallic plates held in grooves to form anodes, the lower edges of plates being held in a plane below the upper edge of the outlet of amalgamating tank to form a trap, a metal plate within amalgamating tank below plates and forming a cathode, amalgamating tank adapted to contain mercury, a pump in connection with junction member, and arranged to pump the material from junction member into amalgamating tank, and means mounted on the supporting frame and in connection with the amalgamating tank for agitating the same.

METHOD OF SAVING METAL VALUES FROM SLAG.—No. 810,364; C. M. Allen, Lolo, Montana.



The method of saving metal values from slags, which consists in withdrawing the slag and matte from beneath the surface of the molten bath, thereby trapping the blast, and permitting them to overflow from a furnace-spout into a forehearth or separating-chamber, and conserving the original heat of the matte and slag by protecting them from the chilling effect of air during their flow into the forehearth or separating-chamber.

PROCESS OF SEPARATING MINERALS.—No. 809,959; E. B. Kirby, Rossland, Canada.



The process of separating minerals, which consists in mixing together pulverized mineral material, a considerable quantity of water, and a substance immiscible in water, but of less specific gravity, and which will, in the presence of water, adhere to some of the mineral particles and not to others; in violently agitating the mass so as to break up immiscible substance into minute globules; in allowing mass to settle whereby a considerable quantity of the mineral particles having become coated with substance will float to the top of the mass, and in gently agitating the portion which settles, and in blowing into the same a gas for the purpose of assisting the flotation of substance and the mineral particles coated therewith; in removing the floating layer, and in separating the mineral particles from immiscible substance.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

LONDON, January 17.

The new year has been ushered in with some notable mining discoveries. Taking the first rank in importance, perhaps, is the big strike in the Anaconda. Known in December, if not earlier, by the wise and prudent, the fortunate ones on the ground floor, it has now been revealed to outsiders, the less lucky occupants on the upper floors, where the babes of mining finance do mostly congregate. Even putting the value of the net ore reserves at £20,000,000, as reported, the nourishment left for the said babes is sufficiently diluted for their weaker powers of digestion at something like £13¼ the dose. The Indian section, which enjoys the support of a numerous body of constant admirers, many of whom have done well in following the fortunes of the small but important group of mines in the Mysore district, comes in for a good second place for notice under the head of new developments. The four deepest parts of the Mysore mine are looking remarkably well. In Ribbesdale's shaft, on the 3,226-ft. level north, the lode is 4 ft. wide, yielding an average assay-value of 1 oz. 18 dwt. per ton, and the same showing is found in a winze sinking below this level. The lode also has the same width in the south breast of the 3,226-ft. level, with an assay-value of 18 dwt. per ton, while a width of 1½ ft., with 1 oz. 17 dwt. per ton, is reported in the eastern workings on the same lode. In the 1,870-ft. level going south, after an extension of 391 ft., a new ore-shoot has been cut 2 ft. 6 in. wide, averaging 1 oz. 18 dwt. per ton. This mine, which made a record output for December of 18,463 oz., is likely to maintain its reputation during 1906 as one of the great gold producers of the world.

The Chinese "Slavery" question, although likely to create occasion for much irresponsible jabber in the new Parliament now being elected, has had its quietus for the present as a disruptive force in the Transvaal. The licenses already issued are said to cover the importation of coolies until 1907, and these are not to be interfered with by the new Government. There is, therefore, every prospect that the record output of over 21¾ millions sterling of gold during the past year will be equaled, if not exceeded, during 1906. The field of operations also tends to widen in the country outside the Central Rand district. Amongst the recent discoveries in this connection may be mentioned the very favorable development of the reef struck in October last by the East Rand Extension Company, the assay-value being reported as over 2½ oz. for a width of about 2 ft. The progress of this work is being closely watched, and if the improvement continues, it is expected a big impulse will be given to the whole of that portion of the East Rand. On the west central section of the Rand the newly formed Sanella Outcrop Reefs, Ltd., is operating on a block of 912 claims seven miles west of Johannesburg. The railway traverses a portion of the claims, and water supply is said to be adequate. Reefs are reported to have been proved by numerous shafts and cuttings, giving assay-values ranging up to over 2 oz. per ton. The Sanella property being south of the Witpoortje break in stratification, it is believed the same formation as on the Central Rand is assured. Not to be behind in some new interest for the immediate future, Rhodesia sends a report of a new diamond deposit—the result of explorations carried out by the South African Option Syndicate, Ltd. On the northern slopes of the watershed of the Zambesi and Limpopo rivers an alluvial deposit of sand and gravel was found, with a depth varying up to 60 ft. The occurrence of diamonds and other precious stones was considered to be local and due to a pipe in the vicinity. Eventually a deep deposit was discovered underlying the surface gravel, but totally different to it in character. The greatest ascertained depth of this deposit is 24 ft. During one complete month of 30 days 3,220 carats were recovered from the deep deposit, of an average value of 2.14 carats per load. This deposit is proved to extend for 1,500 ft. The maximum cost of working is expected not to exceed 1s. 6d. per load. A large proportion of the diamonds found are stated to be pure white, of finest quality, after cutting. The importance of this discovery is shown by the fact that a pooling arrangement is being made with De Beers. The Transvaal is also in the running for an addition to the copper supply of the world, a new discovery of this mineral being reported in the Oliphants River district.

The expansion in the world's trade during the past year in copper, tin, lead and zinc must have come as something of a surprise to those people—to be found in most lands—whose commercial creed may be summed up in the cry: "The country is going to the dogs." Although the output of copper has nearly doubled in the last decade, there is, in face of present requirements hardly enough to go round. The sources of production of copper, lead and zinc are such, however, that they may probably be counted on to meet the demands of international commerce without any great enhancement of the prices now ruling. It is a question if the same can be said of tin. Our greatest provider of this metal —the Malay Straits—did not increase its exports to this country during 1905, and the quantity available from that quarter is expected to show a falling off in the current year of some 2,000 tons—a serious deficiency. The rise in Eastern exchange is said to be mainly responsible for this state of things. Cornwall, under altered conditions of working and lease tenure, might be called upon for a more liberal output of the historic metal. Financiers, in view of the high price of tin and the improved means of working now in vogue, are found asking whether it would not pay to re-open some of the old mines, whose 'burrows' and desolate ruins of engine-houses are seen dotted about the districts of St. Day, St. Agnes, Helston, and the still farther west. Occasionally some little stirring of the dry bones in the hoary old county gives a mild promise of greater energy and hopefulness. Carn Brea is reported to have four levels developing rich virgin ground; virgin! after jogging along for 50 years or more. At Wheal Grenville, one of the best managed mines, a rich discovery is said to have been made just recently in the bottom level. No more of the old "lanes of tin" appear to be available in Dolcoath, but the "old bal" has shown increase of returns lately. A characteristic find is reported in the *Western Morning News*. A farmer digging for water at Gwinear, west Cornwall, struck rich traces of tin in an outcrop 12 ft. thick. Other outcrops rewarded the farmer's search, and it is said that parcels running from 250 to 500 lb. black tin per ton of 'stuff' have been prepared as samples. All of which shows that romance still vies with tin and pilchards as a product of "the old county."

TORONTO, January 25.

The question of the feasibility of smelting Canadian magnetite iron ores by the electric process is at present attracting much attention among mining men and metallurgists. A series of experiments to determine whether this can be done on a sufficiently economical basis to compete successfully with the present method are now being carried on at Sault Ste. Marie, Ontario, under the direction of Dr. Heroult, the noted French specialist. Early in 1904 a commission consisting of Eugene Haanel, Dominion Superintendent of Mines; F. W. Harbord, Metallurgist to the Government of India; C. E. Brown, of Peterborough, Ontario, and E. Nystrom, mining engineer, visited several places in Sweden, France, and elsewhere on the European continent, where the electric smelting process is carried on. They were accorded special facilities for making comprehensive tests as to the cost of smelting operations, and the result was a report highly favorable to the system. Last year the Dominion Government appropriated $15,000 to defray the expense of making practical tests in Canada to determine the adaptability of the process to Canadian ores and conditions, a special plant for the purpose being erected at the Sault Ste. Marie steel works. The tests so far made at the Sault have been on a small scale. The final experiments will be made with larger bodies of ore in a furnace of special design. Dr. Haanel went to Sault Ste. Marie this week to make an inspection of the plant preparatory to this test.

The experiments up to date have shown that nickel pig can be produced by the electrical treatment of nickeliferous pyrrhotite. The scope of the experiments includes other ores than iron, though the economical treatment of the latter is the main object in view. The discovery of the applicability of the process to nickeliferous pyrrhotite is regarded as of considerable importance to the Sudbury nickel industry, as much of the ore of that district is of this character.

Should the treatment of magnetic iron ore on a fairly large scale prove economically successful, it will solve the difficulty as to cost of fuel which has hitherto prevented the development of large deposits of iron ore in Ontario and Quebec, the distance of which, from the extensive coal supplies required by the ordinary smelting process, has so far been an insurmountable drawback to their exploitation.

Other experiments in the same direction are being carried on in Ontario. J. W. Evans, of Deseronto, Ontario, has forwarded to the Provincial Bureau of Mines specimens of steel manufactured directly from iron ores by electric furnace. One of these was smelted from titanium iron ore from the Horton mine, the time occupied in the process being 15 minutes. The other was produced from sulphurous iron ore from the Coe Hill mine in 20 minutes. Both appear to be of good quality. If these results can be produced on a larger scale, large quantities of these ores which, owing to their refractory character are not at present commercially valuable, may be profitably worked.

The mild winter has been favorable for continuous work in the Cobalt mining area, where several mines have been in operation throughout the season. The lack of smelting facilities which has hitherto been the great drawback will shortly be remedied. Timmins, Dunlop & McMartin, of La Rose mine, have given a contract for the erection of a smelter in which they will treat their own ores, as well as the output of other mines. W. G. Trethewey, one of the largest mine-owners, states that the latest reports from his property are highly encouraging. Samples taken at a depth of 65 ft. show a higher percentage of silver than those from the surface in the same locality. Much difficulty has been experienced in guarding the Gillies timber limit just south of the mining area from the inroads of prospectors, some of whom have removed ore. A number have been driven off the limit and several are under arrest. Fears are entertained for the health of the camp when the spring opens, as the sanitary conditions are very bad and the water is contaminated. Strict precautions will be necessary to avoid an epidemic. A great rush of miners, prospectors and speculators is anticipated, including a large number from the mining districts of British Columbia. Many companies are being organized and putting shares on the market at low figures to catch the small investor. Few, if any, of the properties of known value are offering any stock to the public.

A Toronto branch of the Canadian Mining Institute was organized on the 17th inst., the following officers being elected: Chairman, Eugene Coste, mining engineer; vice-chairman, B. A. C. Craig; treasurer, George Nickle; secretary, S. Dillon-Mills; councillors, A. P. Coleman and Willet G. Miller. This organization will co-operate with other branches organized at different mining centers of the Province in influencing legislation affecting mining interests. The meeting of the Ontario legislature has been called for February 15, and one of the most important measures to be considered is a thorough revision of the mining law, which is in a very complicated and unsatisfactory condition and entirely unsuited to present requirements. What is more especially needed is a clearer definition of the respective rights of the miner, the settler and the lumberman, the prevailing uncertainty under conflicting regulations giving rise to constant trouble and confusion.

ALASKA.

William Wehner has brought suit in San Francisco against Alexander Bauer to recover $42,651.88, the alleged cost of a hydraulic mining plant erected on Forty Mile river, Alaska, for the defendant.

Mineral development has become so active in the extreme eastern part of Alaska, and in the western part of the Yukon Territory, that an urgent demand for the marking of the international boundary has been made by mine owners and prospectors. Within the last few months it has been demonstrated to the satisfaction of several prominent mining operators that immense bodies of copper ore exist in eastern Alaska, especially in the White River region. The White river rises in eastern Alaska, but soon crosses the international boundary and empties into the Yukon south of Dawson. The part of the boundary involved is described in treaties between the United States and Great Britain as the one hundred and forty-first meridian of longitude, but prospectors cannot readily determine longitude, and there is confusion as to whether certain claims are in American or Canadian territory. As the mining regulations of the two countries are radically different, it is necessary to have a determination of the matter. What is wanted is the erection of visible monuments to define the boundary, and negotiations looking to the prosecution of this work by an international survey party have been opened between the State Department and the British Foreign Office.

The Copper River & Northwestern Railway Co. has completed its plans for a standard gauge track 360 miles in length from a point three miles west of Valdez and extending to a point a few miles west of the Canadian boundary. The present scheme embraces two branch roads, in addition to the main line, one of these being 40 miles in length and leading to the White river country, and the other thirty-five miles in length. This announcement was made before the Senate Committee on Territories by John Rosene of Seattle.

ARIZONA.

Cochise County.

The Empire State Mining Co. will resume work soon at Tombstone under the old management with Alex Erickson as mine superintendent.

The Naco Smelting & Refining Co., of Naco, has contracted with the Naco Real Estate & Improvement Co. to put in a smelter, to cost $75,000, and to have an initial capacity of 250 tons. Construction work is to begin within 90 days.

The first regular convention of the Arizona Mines Association will meet in Bisbee on Monday, April 9.

Mohave County.

The Tennessee mine at Chloride is being re-opened by S. R. Rhea.——The Yucca Cyanide Mining & Milling Co. is to begin active operations at the San Francisco mine, near Yucca, on March 1. The main shaft will be sunk 550 ft. deeper.

Pinal County.

A shaft is being sunk on the Augustine mine, near Florence, to a depth of 1,000 feet.

Manager George B. Chittenden of the Saddle Mountain Mining Co. reports that the new copper jacket furnace is capable of handling 150 tons of ore per day. This matte is shipped and sold to the Arizona Smelting Co. at Humboldt, Arizona. This property is on the north side of the Gila river, 15 miles east of Troy and 6 miles east of Winkleman, the present terminus of the Phœnix & Eastern Railroad.

Yavapai County.

The 40-stamp mill on the White Gold Mining Company's properties, near Wickenburg, is completed.—— F. O'Brien is putting in new machinery at his mines, near Wickenburg.

A contract has been let by the Arizona Gold Lode Mines Co., of Dewey, for the immediate installation of a cyanide plant of not less than 25 tons daily capacity.—— C. T. Joslin, of the Ideal Mining Co., of McCabe, is replacing the iron pipes at the mine with wooden pipes, the former having proved unserviceable owing to the presence of sulphuric acid in the water at the mine.

A pumping plant is to be put on the Agua Fria, to throw water through a six-mile pipe-line to the Little Jessie mines at Palace Station, near Prescott. Preparations are also being made for the erection of a mill at the mines with a capacity of 200 tons of ore a day.

CALIFORNIA.

Calaveras County.

The new owners of the Hog Hill or Napoleon mine, near Telegraph City, have started work. Engineers are at work widening the road from Milton to the mine, as it is intended to use a traction engine.

Contra Costa County.

The Mountain Copper Co., at Bull's head, east of Martinez, shipped to San Francisco recently 150 tons of copper. This is the first shipment the company has made, and has been re-loaded at San Francisco to a deep-sea vessel to be taken around the Horn to the refinery plant in the East.

El Dorado County.

The mill at the Sherman mine, north of Placerville, has been started. The shaft is down 250 ft.——The Mt. Hope mill, at Grizzly Flat, is running on good ore from the mine.

Fresno County.

An estimate of the production of crude petroleum in the Coalinga field during 1905, compiled by the Coalinga *Oil Record*, places the figures at 8,471,000 bbl. This is nearly 400,000 bbl. less than the 'official' figures. The monthly production of this field is 867,000 bbl. On January 1 there were 228 producing wells, with an average production per well of 135 bbl. Twenty-nine wells were drilling, with fourteen suspended and eight shut in.

Humboldt County.

Bert Lucas, owner of the Humboldt War Eagle mine at Willow Creek, 46 miles from Eureka, is in San Francisco for the purpose of purchasing a 50-stamp mill.

Kern County.

The DeGollia-Atkias Co., which recently purchased the tungsten properties belonging to the McCarthy-Taylor Co., has shipped a carload to Germany from near Randsburg.

In anticipation of the drawing off of the water of Kern river by the Edison Electro Co. upon completion of its works near Bakersfield, many placer mining claims have been located along the banks of the river where the stream will be drained. The power plant will be completed in September.

Nevada County.

The 20-stamp mill at the Central Consolidated mine, east of Nevada City, has been started. It is equipped with four concentrators and a slimes plant.

The concrete foundation under the west end of the new 30-stamp mill at the Champion mine, near Nevada City, was undermined by the overflow water from the creek last week. The west end of the main hoisting works was also damaged, the concrete foundations being weakened to some extent.

The Maryland mine, near Grass Valley, has been unwatered to the 800-ft. level and ore is now being taken out on the 500-ft. level.

The Posey gravel mine, west of Grass Valley, has been bonded by Robt. Richardson, who intends to run a 600-ft. tunnel.

The Isis Gold Mining Co. will put in a 5-stamp mill at Canyon creek, near Washington, as soon as the roads will allow hauling the machinery.

Placer County.

Superintendent Geo. McAulay is increasing the working force at the Jarvis mine, at Red Point.——The Paragon hydraulic mine, at Bath, has been closed until the water can be drawn from the pit.——The leasers working the Red Point mine are preparing for a big season's work.——The Eureka, Butts, Hathaway and Kirkland mines, near Ophir, have been bonded by D. C. Munroe of New York. Electricity will be put in for power.——Work in the shaft of the Hidden Treasure mine, at Bullion, has been temporarily stopped by the flood of water from the melting snow.

San Bernardino County.

C. E. Wilbur, manager of the Standard Nitrate Co., is building a reduction plant in the Chimehuevis valley. ——It is expected that the steam plant at the Vivian mine will be completed soon.

The Bonanza King Development Co. of Los Angeles is preparing to build a 10-stamp mill at the mine in the Providence mountains, which it acquired two years ago and which it has been working since last September. The mill is to be running by May 1st.

John O'Donnell has made a strike on his claim in the Grapevine district which has caused a rush from Barstow. The region has been located for miles.

San Luis Obispo County.

The California Petroleum Refineries Co. has decided to purchase 115 acres of land near San Luis Obispo for an oil refinery. The company also will build a wharf, and contract has been signed to take the product from the Graciosa Oil Co. for the next 10 years. A pipe-line will be laid from the wells to the refinery.

Sierra County.

Robt. Jones and associates, of San Francisco, have bonded the Hilda mine, near Sierra City, and will work it as a drift mine when the weather allows.

Siskiyou County.

Owing to heavy rains and subsequent cold weather, work has been stopped temporarily on a number of claims.——The Yreka Creek Dredger Co. has been drilling in Yreka Basin, between Yreka and the mouth of the creek at Shasta river, below Hawkinsville.——Ault & King have started a tunnel 150 ft. below the discovery workings at their claim on Six Mile Creek.

The Black Bear group, which consist of the Yellow Jacket, Black Bear, South Black Bear and East Black Bear, near Yreka, has been sold to San Francisco parties by John Daggett and Son. The new company intends to commence development work and will add a cyanide plant and mill.

Trinity County.

The 25 miles of ditch to carry water from the east fork of Stewart's Fork to the Beaudrey and Unity mines, near Minersville, are almost finished. The five giants will soon be started.

Tuolumne County.

Beginning April 1st, the Longfellow mine, near Groveland, will be operated by electric power from the Blue Lake plant.

The Omega mine, near Jamestown, has been sold to the Mother Lode & Table Mountain Gold Mining Co. The three-compartment shaft is down 165 ft. Drifting is to be started to open up the vein and a nearby gravel deposit.

The Louisiana mine at Cherokee has been bonded by the Laurel Gold Mining & Development Co., and machinery is being secured for immediate work.

COLORADO.

(Special Correspondence).—Some of the mines in the Cripple Creek district are reported as having declared their intention to not renew the leases as they expire on the property, but will resume operations on company account, believing that they can do more and better work for the stockholders and at the same time increase the profits. In some instances the leasers have been able to make money where the company operating on its own account has not been able to pay expenses. While the leasers may make more money for the company in handling the ore cheaply, yet they do not as a rule take as good care of the property as the company. ——The mining of tungsten in Boulder county is in a more prosperous condition than for some time past. During the early fall and winter there was a scheme on foot to combine all the tungsten producing properties, which did not prove a success. For a time the price of tungsten was cut very materially and many of the mines closed during the low price, but recently the price is understood to have advanced and properties are beginning to be opened up.

Denver, Jan. 29.

Clear Creek County.

E. F. Fitzgerald has resumed work on the United States tunnel on Chicago creek, near Idaho Springs, after an idleness of ten years. He secured under bond and lease all of the interests in the Washington, Crosscut, Accidental, Harrison and other lodes. These veins will all be cut by the adit on the United States lode. The adit is in 670 ft., and is expected to cut the Washington within the next 450 ft.——Maxton Bros., after a temporary shutdown, are preparing to start up the Lebanon property, near Georgetown. A compressor is to be put in at once. A concentrator is planned.

John Oaklum has resumed operations on the Scott lode on Republican mountain, near Georgetown. A shaft is to be sunk to prove the continuity of the ore streak.

The Waltham Mining & Milling Co., of Idaho Springs, is sinking the Ward shaft, which is now 209 ft. deep, another lift and will continue it to a depth of at least 800 ft. The lower levels demonstrated the existence of an orebody, which carries lead in sufficient quantities to make it a desirable smelting ore, and this discovery upset the plans of the company, which had put up a cyanide plant to treat the ore, with the expectation that the oxidized ore extended to a considerable depth. The collar of the Ward shaft is near Chicago creek at almost the lowest altitude in that section, so that the shaft will be the deepest in the district. The tunnel method cannot be used.

The Covode Mining Co. has resumed operations on the crosscut tunnel running on the east slope of Covode mountain, near Empire. B. J. Hatmaker, of Rochester, N. Y., is superintending work.

The Scotia Mines Co. has resumed work on the Maine-Phœnix group on Sherman mountain, near Silver Plume. A working privilege through the old Antelope tunnel for five years has been secured by the company. In this tunnel a drift on the Maine lode has been driven to the boundary of the Antelope ground, and this level is 120 ft. below the workings that are now being cleaned out. The company intends to build a concentrating mill. The Scotia company has a lease on the Backbone and other lodes, which will be worked in connection with the Maine, Scotia and Phœnix.

Manager F. A. Maxwell is preparing to resume work at the Empire tunnel, near Empire, which is now in 3,100 feet.

Eagle County.

James W. Newell, general manager of the Pittsburg Gold-Zinc Co., is investigating the Iron Mask mines at Red Cliff. They are now shipping from 2,000 to 3,000 tons a month to the Colorado Zinc works at Denver. The zinc content averages 45 to 47 per cent. The oxidized iron output is 50 tons daily, carrying gold, silver and lead.

The Polar Star mine, near Red Cliff, has been leased and bonded to Graham and others for five years, and a force is already opening it up. Pontius & Co. are driving the Johnson lode, near Red Cliff.

Gilpin County.

A strike of good concentrating ore is reported from the 1,400-ft. level west of the Old Town mine in Russell district, near Central City. G. J. Mitchell of Idaho Springs is manager. —— A new hoist is being put in at the Forks mine on Quartz hill, near Central City, by Manager E. C. Betts. —— The Eagle Ore & Milling Co. has leased the Engelburg mine on Winnebago hill, near Central City. J. G. Eversman & Co., of Denver, are interested and will put in new machinery. The shaft is down 200 feet.

Hinsdale County.

The Moore plant of the Hanna Mining Co., near Lake City, which has been entirely remodeled, will start its electric separating machines and other concentrating devices soon.

Work is to be resumed at the Armitage mines in Silver Coin gulch, near Lake City, by G. F. Gardner.

Lake County.

Lessees operating the Ella Beeler in Iowa gulch, Leadville, while making connections for an air-shaft between the upper and lower workings, struck a good orebody. ——Recent developments in the Cloud City show that it will soon become one of the heaviest shippers of manganese ore in Leadville.——The orebody in the Home extension has been opened in the Cloud City territory to the east, and when both of the ore-shoots are opened the operators will be able to ship 75 tons daily.——The Little Nell, on Carbonate hill, which is being worked at the 525-ft. level, is shipping a good grade of mineral and they are developing at a lower level to catch the shoot below.——At the Old Enterprise shaft, west of the Castleview, a drift is being run to connect the two properties which, when completed, will enable the lessees to double the present output. From a raise in the drift a large body of manganese has been cut.

La Plata County.

(Special Correspondence).—A good strike has been made on the Gold Dollar. Hunter & Price, who have a lease on the property, opened up three feet of ore which is said to be all of shipping grade. They are now at work on the lower tunnel and drift.——A small force is at work on the Bay City driving the crosscut tunnel.—— W. A. Stewart has purchased the interests of Hawkinson, Fry & Reynolds in the Alpine claim, near the Idaho, and will commence development at once.——The May Day continues its shipments of about one carload per day. The lower tunnel, which will be made the main working tunnel, is being extended to cut a vein east of the developed vein, and the framework for the tunnel terminal of the new tramline is almost completed. The ore-washer will be moved to this point.——Heavy snows and slides have closed the road to the Empire mine, and, the coal supply becoming exhausted, operations have been suspended until it is possible to open the road.

Marcos, January 29.

Ouray County.

The Crawford-Jackson Gold Lion Mines Co. has secured title to claims in the Red Mountain-Ironton district. Work will be commenced on a tunnel that will develop the property for a mile and a half under the western slope of the range toward the boundary lines of the Camp Bird properties. Starting nearly opposite the Joker tunnel above Ironton to the west at the mouth of Galena Lion gulch, the bore will be driven west, following the course of the Mountain Lion lead and cutting the Betsy lead. Work on the tunnel will be started by hand.

San Juan County.

Four electrical separators are to be placed in the Grand Mogul mills at Gladstone to concentrate the zinc ores.

San Miguel County.

Under the management of Otto Erickson, the Caribeau-Montezuma mines at Ophir are making a good record. Large areas of new stoping ground are being blocked out. The concentrating plant is treating 35 tons daily. The capacity will be enlarged in the spring to 100 tons daily.

George B. Pickett, manager of the Carbonero mines, on Silver mountain, near Ophir, has just started a deep crosscut tunnel which will cut the Carbonero vein at a depth more than 2,000 ft. The ore from the Carbonero is shipped to smelters as it is taken from the mine, with scarcely any sorting. After the lower tunnel has been run 300 ft. an air compressor will be put in and drilling thereafter done by machine.

Summit County.

The Pennsylvania mine, near Argentine, W. B. Le Wald manager, is operated through a crosscut tunnel and is producing daily seven tons of shipping ore, which is hauled nine miles to the Colorado & Southern Railway at Keystone.

Teller County.

Construction work on the mill and cyanide plant of the Wishbone Gold Mining Co., between Mineral and Carbonate hills, Cripple Creek, has begun and it is expected that the new plant will be completed by April 1. The plant will be of 100 tons daily capacity.

The Oro shaft on Ironclad hill, Cripple Creek, is to be continued from the 120 to the 220-ft. level, by Lessee Springer, of Colorado Springs. A hoist is to be put in. ——R. A. Airheart intends to sink from the 350 to the 600-ft. level of the Rocky Mountain, on Beaver hill.—— Leases on the Last Dollar mine, near Cripple Creek, are not to be renewed, as the company will resume on its own account.——Snell, Crump & Harrison, who have a lease on the Little Joe claim of the Alert Co., on Ironclad hill, are preparing to put in machinery and sink the shaft from the 100 to the 200-ft. point.——The Henry Adney shaft, in Beacon Hill gulch, is down 600 ft. and a crosscut has been started toward the C. K. & N. vein by Superintendent David J. Burke.

At the annual meeting of the stockholders of the Golden Cycle Mining Co. it was decided to expend $400,000 in enlarging and improving the Telluride mill at Colorado City, giving the mill a capacity of 400 tons daily. The minority stockholders, who have been fighting the purchase of the Telluride plant in the courts and at stockholders' meetings for months, were not represented. The mills will be in operation by Aug. 1, and the cyanide process will be used. The rebuilding of the Telluride mill is the outcome of a long fight. The plant was built for the chlorination process by the old Telluride Company but proved unsuccessful and the General Metals Company, which bought the mill, went into bankruptcy. New drums have been put in on the hoist in order that 300 ft. more of cable may be used. The shaft will be sunk 100 ft. more, extending it to a depth of 1,100 ft. The shaft of the Theresa property, adjoining the Cycle and belonging to the same company, will be sunk to the depth of 1,000 ft. The shaft is now down 700 ft. It is the intention of the Golden Cycle people to use the Theresa shaft for hoisting and lowering men and to handle all of its ore through the shaft of the Cycle.

Nicholas Gardner and associates, lessees in the Home claim of the Cedar Hill Gold Mining Co. on Ironclad hill, near Cripple Creek, will sink the shaft, which has been sunk to a depth of 145 or 150 ft., 100 ft. deeper.—— An ore shoot has been struck by Weber & Snyder, lessees, in the Gold Sovereign property, near the northern extremity of the Trilby.——A steam hoist has been moved from the Los Angeles mine to the Dante mine, and set up at a shaft 400 ft. deep, through which lessees are operating.

IDAHO.

Blaine County.

The Supreme Court of Idaho has confirmed the title of Fred C. Bradley and R. F. Bueler, of Hailey, to the Snowslide mine in the Muldoon district.

Boise County.

M. E. Hopkins, manager of the Nellie mine at Horseshoe Bend, reports that the long crosscut tunnel has been driven 800 ft., and has about 200 ft. more to go before reaching the main vein.

Idaho County.

The Hogan mine at Orogrande is making a better showing. The batteries are to be changed from single to double discharge and additional riffles put in. The copper riffles already in place are proving effective in catching the coarse gold from the rich streak.—— Duluth and Eastern men are developing the Butterfly group, south of Orogrande.

E. Haug, superintendent of the Dewey mine, is preparing to add 10 stamps more to the present mill near Roosevelt. —— The owners of the Sunnyside mine, near Roosevelt, intend putting in a cyanide plant.

Nez Perces County.

The new dredge ordered by M. H. Hare for the placer grounds near Pierce is at Greer, ready to be transferred to Pierce. It has a capacity of 2,000 yards daily. This will be installed and ready for operation in the spring.

Shoshone County.

Fire broke out Jan. 30 in the Bunker Hill & Sullivan

mine at Wardner, between the sixth and seventh levels. The smoke and gas speedily drove the 75 miners from the workings. Many of them were nearly overcome and reached the surface with difficulty. A section of blazing fuse or a candle left carelessly in the mine is believed to have started the fire. Late reports state that the fire is under control and no damage has been done other than that by smoke.

MICHIGAN.

Houghton County.

(Special Correspondence).—There has been no change in the condition of the Tamarack mine during the past two weeks. Owing to the fact that three men were caught underground at the time of the fire the management kept the shafts open for several days in the hope that these men might be enabled to escape, but when it became apparent that there was no further prospect of the release of the unfortunate miners, the three shafts affected were sealed with heavy timbers, and the cracks in the timbers tamped with earth and clay. The shafts have been sealed for nearly two weeks, but gas is still escaping through the cracks in the sealing and in such quantities that men working in the shafthouses have been overcome on several occasions by the carbon monoxide fumes coming from the underground openings. There have been so many and such serious fires during the past twenty years in this district that a considerable fund of experience has been accumulated, and a regular plan of fighting such fires is now followed. In the earlier fires at the Calumet & Hecla, nearly twenty years ago, attempts were made, with partial success, to drown the flames by means of carbonic acid gas, which was manufactured in large quantities in immense steel boilers by treating crushed marble and limestone with dilute sulphuric acid, pipes from the boilers being connected with the mouths of the shafts, and the resulting carbonic acid gas, which is heavier than atmospheric air, being allowed to drop by its own weight to the bottom of the mine and stifle the flames by cutting off all oxygen. Further experience has shown that the most successful plan of dealing with a fire in a deep mine is to seal over all shafts connecting with the flames, and thus starve the fire from lack of oxygen.

Houghton, Jan. 29.

MONTANA.

Deer Lodge County.

Four of the largest induction motors ever installed in the West will be used to furnish power at the $9,000,000 reduction plant of the Anaconda Copper Mining Co. The Allis-Chalmers Co. of Milwaukee will furnish this electrical equipment for the 8,000-ton concentrator and the street railway company at Anaconda. The concentrator equipment will consist of four 1,200-h.p. induction motors, three 300-kilowatt motor generator sets, together with the usual auxiliary accessories. This order follows the determination of the Anaconda company to substitute Missouri river power, transmitted 90 miles at 70,000 volts, in place of the present power system. Each of the big induction motors will weigh over 40 tons, the weight of the entire equipment when ready for shipment being 259 tons. The motors will be used in the concentration building, which is 600 ft. long, through which a main line shaft extends the entire length. The motors will be rope-connected to this shaft and will carry the entire power load.

Fergus County.

Henry M. Rae, manager of the Drake properties at Kendall, says that the contract has been let for sinking a shaft on the North Moccasin at Kendall. The work is to begin at once, and when the shaft is down, the company will drift to the ore struck by the diamond drill. An electric hoist has been ordered.

Granite County.

Manager George H. Savage of the Milwaukee Gold Extraction Co., in the Red Lion district, near Philipsburg, states that work has been suspended until spring on account of the freezing of the water supply.

Madison County.

F. M. Longshore, H. A. Fosselman and B. J. Wall, owners of the Copper Chief property, at Silver Star, have arranged to put in pumping and hoisting apparatus within 90 days.

William C. Morris & Brother have suspended operations in the Strawberry 10-stamp mill, near Pony. They had been running the mill on ore from the Boss Tweed and Clipper mines on Mineral hill.

Silver Bow County.

(Special Correspondence).—The Butte Copper Exploration Co., with a capital of 100,000 shares at $5 par, is the latest copper mining company to be organized in Butte. The company has purchased seven quartz claims northeast of the Pittsburg & Montana company's properties, and 11½ acres of placer ground adjoining the quartz claims. The ground lies outside of the developed portions of the Butte district, but there are two shafts on the ground, one 440 ft. deep and the other 130 ft. deep, which were sunk years ago by prospectors. Several veins run through the ground, but the early prospectors did not find in them sufficient value to justify further development work at that time. Among those interested are E. A. Nichols, of Butte; N. Bruce McKelvie, S. R. Hill, F. E. James and Thomas S. Dee, of Boston, and A. F. Leopold, of Chicago.——Ralph Baggaley, who has been manager of the Pittsburg & Montana company since its inception four years ago, has resigned and will return to his home in Pittsburg. Oscar Rohm succeeds him as general manager. Mr. Baggaley says his retirement is in line with his original intention when he took hold of the company, and that was to leave the active work to others as soon as the company was placed on a paying basis. He still retains his interest in the company. The company is now treating 200 tons of ore a day, which is the limit of the present smelting plant.——The Amalgamated Copper Co. is striving to break all records of copper production in 1906. Its January product will reach 23,500,000 lb., and the output will likely be increased gradually through the year, if the price of copper and the demand for it are maintained.——The Washoe smelter, at Anaconda, is treating 7,800 tons of ore daily, while the Boston & Montana smelter at Great Falls is treating 3,780 tons a day. The output of the other companies operating in Butte has also been increased.——The East Butte company is not hoisting any ore at present from either the Dutton or Yankee Boy mines. The latter is undergoing repairs and the Dutton shaft is being converted into a three-compartment shaft to be used as the main working shaft for all the East Butte mines. It is being enlarged from the 300-ft. level to the surface, and when that portion of the work is completed a new hoisting plant will have been installed and sinking to a depth of 1,000 ft. will be begun. Crosscuts will be run north and south. In the meanwhile leasers will continue working the Mary McLane, Lassan, Wheeler, Oneida and Simons mines, and it is expected that the royalties will pay for the contemplated improvements and development work. The company has added 100 acres to its holdings. It will be six months before the company's mines will all be producing ore again.

Butte, January 29.

Boston & Montana is shipping from its Butte mines to Great Falls 112,000 tons of ore per month. The shafthouse on the Poulin mine is being torn down by the Amalgamated on account of the likelihood of fire. The house is not being used and has not been occupied for some time. The mine is being worked through the Mountain Consolidated. The company has adopted this policy in regard to all its unused shafthouses of any size.

NEVADA.

Esmeralda County.

A representative of the Mammoth Copper Co. at Kennett, Shasta county, Cal., has been making contracts for the delivery of a maximum of 200 tons of ore daily to the smelter from Goldfield and Tonopah. They have offered a shipping rate of $9 per ton to the smelter, $2 less than the present tariff charged by the railroads.

Contracts have been let by Surveyor-General Kyle for the surveying by township lines of half a million acres of unsurveyed mineral lands near Kawich, Lida, Bullfrog and Ash Meadows. Contracts covering nearly twice as much territory will be let later in the month, and the work is to be begun at once.

At a recent meeting of the Manhattan Miners' Union a scale of wages for the district was adopted as follows: Drifting, stoping and trenching, per shift, $4.50; sinking and raising, per shift, $5; working in wet places, 50c. per shift extra; tool dressers and blacksmiths, per shift, $5.50; timbermen (no helpers), $5; machine work, 50c. extra per shift more than hand work; engineers, per shift, $5.50; all contract work $1 per shift more than company work. No man in or around the mines will be allowed to work more than eight hours.

A new 50-h. p. electric hoist is being put in at the January mine at Columbia. An assay office has been built and is now being equipped.——Arrangements are now being made by Harry Taylor and Gurney Gordon to sink a shaft on the ledge at the C. O. D. mine at Goldfield.

Nelson Brothers, of Goldfield, have let a contract for a 200-ton sampler, to be erected within the next few months.——Henry Jaggles of the Lida Queen, at Lida, is in San Francisco negotiating for machinery. It is proposed to erect a roller mill of 70 tons capacity at the mine, the water to supply which will be piped from Mt. Magruder, where the company owns two springs. A hoist of sufficient capacity to go 1,000 ft. is to be included in the equipment.——F. L. Felter, secretary of the Gold Mountain Exploration Syndicate, of Gold mountain, near Goldfield, states that the syndicate will drive a two-track tunnel into the mountain.——The new five-stamp mill at the Mohawk-Alpine mine, at Silverpeak, has started up.

Eureka County.

B. L. Plummer, manager for the company who recently bonded claims at Mineral Hill, states a 50-ton furnace is to be put in under the supervision of Charles H. Gage. G. L. Kennedy is at the mines.

Lincoln County.

At Jack Rabbit, 16 miles from Pioche, the Nevada-Utah Co. has retimbered the old workings of the Day mine. An aerial tramway has been built to connect the mine with the receiving bins along the tracks of the narrow-gauge railroad, which connects Jack Rabbit with Pioche. This road is now owned by the Nevada-Utah Co.——At the Meadow Valley mine the No. 5 shaft is being retimbered. This shaft is 1,200 ft. deep.——At the Raymond & Ely mine, near Pioche, a new shaft-house and gallows-frame have been built over the Phœnix shaft, which is being re-timbered.

W. H. Wilson, general manager, C. H. Raymond, assistant general manager, and C. E. McCarthy, engineer of the Good Springs and Sandy smelter company, while in Los Angeles announced that arrangements have been made to build a 100-ton smelter at Good Springs and one of equal capacity at Sandy.

Nye County.

E. A. Montgomery, of the Montgomery-Shoshone mine at Bullfrog, has been in San Francisco arranging for new machinery and for a 150-stamp mill.

The United Investors' Co., of New York, which has bought the Peerless group, at Bullfrog, has men at work on two crosscut tunnels to intersect the ledges running from the Denver mine.

Washoe County.

The Green Hill-Nevada Co., under the management of J. M. Thomas, with J. D. Poole as superintendent, is blocking milling ore in their claims, near Olinghouse.——The Jim Blaine mine at Olinghouse is being worked by the Ohio company, under the management of E. P. Clemmons.——The Keystone-Nevada company has 400 tons of milling ore on the dumps and a large tonnage blocked out on the Ora at Olinghouse. C. H. Bovee is general manager and Geo. W. Lloyd superintendent.——The Olinghouse Mining Improvement Association has been formed, with J. M. Thomas Jr. as president, R. W. Snow vice-president and O. M. Pudor secretary.

White Pine County.

In the Ely district, the crosscuts on the 750-ft. level of the Alpha vein, owned by the Giroux Consolidated Mines Co., are showing good values. The station is being cut on the 300-ft. level of the Giroux and the ore body will be blocked out for extraction in the spring.——The first payment of $6500 has been made by the Nevada Con. Copper Co. on the Elkhorn and Sunset claims, which are under bond from F. F. and H. A. Leoch.——The Cumberland - Ely Co. is sinking four double-compartment shafts on the Jupiter group. The deepest shaft is down 75 feet.

NEW MEXICO.

Grant County.

S. L. Bean, who is interested in mines in the Virgin district, has decided to build a smelter in the spring at Shakespeare, 10 miles from Lordsburg.

Otero County.

The grading for the new Y to the smelter site at Jarilla Junction has been completed. Contracts have all been let and material will begin to arrive shortly.——The Southwest Co. has completed the grade for another electric railway, mine gauge in width, from the upper terminal of the Lucky tramway to the Iron Mask at Jarilla Junction. This road is intended to afford easy access to the iron ores of Iron mountain.

OREGON.

Baker County.

T. H. White, C. W. Durkee and W. Ayres, of the Gold Coin mine, have returned to Baker City, from Portland, where they let a contract for a 100-stamp mill to be added to their present 10-stamp mill. They also ordered a new hoist to be shipped at once. Water is to be developed by a sinking plant with a three-compartment shaft.——Managing owner James A. Panting of the Gold Hill mine at Durkee, has had a full force retimbering some of the tunnels and stopes.——J. H. Graham, of Baker City, has secured possession of the Gold Coin Extensions No. 1, 2, 3, and 4 from J. J. Neel.

Work in the long crosscut at the Gold Bug mine, near Sumpter, has been discontinued, and the force has been placed in vein 3 drilling to the south.

Clackamas County.

Work has been resumed on the Copper Queen mine, near Welches, under the supervision of C. O. Merril.

Grant County.

W. W. Gibbs, superintendent of the Copperopolis mine, near Prairie City, will install a mill on the property this spring.

Jackson County.

All the main tunnels and drifts at the Opp mine, near Jacksonville, are now lighted by electricity. The company has put in an air compressor and power drills. It also plans to increase the capacity of the mill from 10 to 20 stamps early in the spring. Two shifts are taking out ore and putting in the bins for reserve.

The Opp mill, near Jacksonville, has been rebuilt and new concentrators put in.

SOUTH DAKOTA.

Lawrence County.

The Golden Reward Co., of Lead, has commenced to run a tunnel near the Ruby Bell mine to connect with the bottom of the Union shaft and to run in from White Tail gulch to the bottom of the shaft, a distance of 1,300 ft. All the water pumped into this shaft from the stopes in the mine will be discharged through this tunnel.

UTAH.

Juab County.

The following is the list of shipments made by the Tintic properties for the week ending Jan. 26: Ridge & Valley, 5; Centennial-Eureka, 45; Bullion-Beck, 11; Gemini, 20; Eagle & Blue Bell, 6; Uncle Sam Consolidated, 3; Yankee Consolidated, 6; Swansea, 4; Dragon Iron mine, 14; May Day, 4; Beck Tunnel, 5; Eureka Hill (lease), 3; Brooklyn Consolidated, 3; Ajax, 2; Black Jack, 1; Carisa, 4; Grand Central, 14; Lower Mammoth, 2; Mammoth, 17; Victor, 1.

Summit County.

Foreman William Campbell, in charge of the Ontario tunnel, states that work at the tunnel has been suspended on account of foul air, caused to a great extent by recent storms. The wet, heavy atmosphere prevents fresh air from entering the tunnel, and a candle will not burn at the 2,000-ft. mark. Until the weather clears up no attempt will be made to resume work. The face of the drift, where work was being prosecuted when water broke through, has not yet been reached, and the tunnel at the point where the work was stopped is completely filled up with dirt and debris.

Tooele County.

The mill at the New Stockton mine at Stockton has been started up again and the newly installed hoisting plant is in commission. Sinking the shaft 150 ft. deeper, to 1,000 ft. below the collar, will not interfere with the extraction of ore for the mill or for shipment. A new 8-drill compressor is being put in at the mine.

At the Consolidated Mercur at Mercur a crosscut is being run from the electric tunnel to the Magazine vein, to determine if pay values exist under the Magazine stope. The retimbering of the Golden Gate shaft is still in progress, but it is expected the work will be finished and hoisting resumed the first of February. The main station in the Mercur mine is being timbered with 12x12 Oregon fir.

WASHINGTON.

Chehalis County.

The Shaw Crucible Steel Co. has received four carloads of machinery at Hoquiam, which will be transported to their plant at Damon, near Oyehut, by scow. The buildings of the plant are all finished, and as soon

as the machinery is received it will be installed and the plant will probably be ready by March 1.

Ferry County.

(Special Correspondence).—Mill tests have been made at the Mountain Lion mine, under the direction of C. S. Verrill. The mine has been drained to the bottom level. On the east side of the Sherman range, south of Kettle Falls, the Nonpariel and other companies are operating. E. L. Terry and others, of Seattle, are opening up the Orient, Southern Cross, and Gwinn quartz claims. A lower tunnel is in 450 ft. The Gwinn, 3¼ miles west of the other claims, is opened by a shaft, down 150 ft. on the vein.——The Ben Hur shaft is down 319 ft., and drifts are being driven north and south on the vein on the 300-ft. level.

Republic, Jan. 29.

Garfield County.

Fanning Bros. have found a deposit of galena near Pomeroy that assays well in silver and lead.

Okanogan County.

(Special Correspondence).—The south drift from the lower tunnel of the Ruby mine, on Mount Chopaca, ran into a streak of ore rich in ruby silver and silver glance.

Loomis, Jan. 29.

Spokane County.

The owners of the Waverly mine, near Waverly, have decided to open up their property by running a tunnel.

Stevens County.

(Special Correspondence).—The First Thought Mining Co., operating near Orient, is shipping 40 tons of ore a day. —— The Napoleon mine, adjoining the First Thought and owned by the B. C. Copper Co., is producing 30 tons of gold-bearing ore a day, which is being shipped to the company's smelter, at Greenwood, B. C.

Northport, Jan. 29.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District.

The force employed by the Dominion Copper Co. in Phœnix has been increased since the company blew in the second furnace at its Boundary Falls smelter. The Brooklyn is working full time, and three shifts are working at the Stemwinder. The new seven-drill air compressor for the Rawhide has arrived at the mine. It will use electric power from Cascade. At the company's Boundary Falls smelter, the two furnaces are handling 750 tons of ore in 24 hours.

The Oro Denoro, in Summit camp, shipped 1,500 tons of ore to the Granby smelter last month. It is owned and operated by the Denoro Mines, Ltd., of which Smith Curtis is the managing director. Work is being done on the No. 4 vein, on the Great Northern Railway level.

Cassiar District.

William L. Breeze, of New York, president of the Bullion Creek Hydraulic Mining Co., has arrived at Atlin, where he will arrange for the extending of the company's flumes to higher levels, so that a greater head of water may be obtained.

Rossland District.

A 20-ft. shoot of ore has been reached by a crosscut from the 11th level of the War Eagle mine at Rossland. ——A station is being cut at the 1600-ft. level of Le Roi at Rossland.——It is hoped that work will be resumed at the White Bear upon the arrival of J. J. Warren, the managing director. The mine is unwatered nearly to the 1,000 ft. level.——Shipments for the week ending January 27 were: Centre Star, 4,140 tons; Le Roi, 2,130; Le Roi Two, 390; Jumbo, 200; total, 6,860 tons.

Vancouver Island.

The Commodore Mining Co. is preparing to make heavy shipments of engines, boilers, hoisting plant, etc., to its mines on Texada island.

MEXICO.

Chihuahua.

The report of John B. Farish to Dolores Mines Co., whose mines are in the Guerrero district, 120 miles from Minaca, states that the property was purchased upon the reports of Louis Noble, George A. Schroter, Philip Argall, and the results of a check sampling by A. Chester Beatty. Up to the time of purchase the property had been operated by the former owners with the idea of developing large ore reserves, and the latest report shows that there were then in sight in the mine 26,831 tons of ore, of an estimated gross value of $55 per ton, and 11,000 tons on the dump, the cobbings from richer ore which had been shipped, that averaged about $42 per ton; a total of 37,831 tons, estimated to yield a net profit of about $1,500,000. The reports of the examining experts contained no reliable data upon the treatment of the ore, and it would have been unwise to proceed with any construction before reliable tests had been made. These tests were entrusted to Godfrey Doveton and J. Gordon Hardy, and occupied the first three months of the company's life. Upon the completion of the tests the following method of treatment was adopted: The ore is delivered at the top of the mill, where it is screened through grizzlies. The coarse is broken through crushers and passed over a picking belt, the richer ore being picked out and fed separately to a battery of five stamps, where it is crushed through coarse screens and passed into Bryan mills, to be pulverized. The resulting pulp is amalgamated in pans and settlers, and the tailing mingled with the pulp of the lower grade ore. The latter, that which is rejected on the picking belt, is crushed coarse through the remaining 10 stamps, pulverized in Bryan mills, and the resulting pulp mixed (as stated above) with the tailing from the pan-amalgamation plant. This product is separated into sand and slime by spitzkasten and the sand is reduced to slime in a tube-mill, after which all is treated by cyanidation in the usual manner. It is confidently expected from the results obtained by Doveton and Hardy that at least a recovery of 85% of the gross value will be effected. Nearly all the machinery was furnished by the Allis-Chalmers Company of Milwaukee. As all the machinery had to be transported on the backs of mules across the mountains for 120 miles, it had to be sectionalized; that is, all machinery—so far as was possible—had to be reduced to pieces weighing not over 350 pounds. The starting of new enterprises in the mountains, particularly the building of railroads and operations of W. C. Greene, caused a greatly increased demand for the already scarce labor, and it became difficult to retain a full complement of workmen.

John J. Watterson, of Chihuahua, has decided to build a concentrating plant and a reverberatory furnace at his mine in the Uruachic camp. The mill will be built in units of 40 to 50 tons, and only one unit will be put in at present. A refining furnace will be added later.

Guanajuato.

Due to the mining activity around Guanajuato, the district is suffering from a scarcity of labor, says the Jalisco *Times*. Within the next twelve months it is expected that there will be between 400 and 500 stamps dropping in this district, and development work in the mines is being rushed to provide ore for such milling capacity. Good air-drill men are particularly scarce, and there are a number of permanent positions for foremen and shift bosses.——George W. Bryant, manager of the Peregrina Mining & Milling Co., has taken over El Cedro mines under an option. These mines are at the southern end of the mother lode of the Guanajuato district, and have been worked extensively. The mines are owned by a Mexican company.——T. H. Leggett, who is developing El Cubo group of mines in the Guanajuato district, has been directing the work for several weeks past.——Engineers are locating an entrance for the San Gregorio Railroad into Guanajuato, and construction of the line is expected to begin before the middle of the year. The San Gregorio Railroad now extends from Marfil to the San Gregorio mines, and is owned by the Dwight Furness Co. It will enter this city from Marfil, and that portion of the line will form a link of the proposed railroad from Guanajuato to Salamanca, where connection will be made with the National.

Mechanics are at work on three large stamp mills, near Guanajuato. The largest, which is just being started, is being erected at the Peregrino mine, with 120 stamps. The second is being erected at La Luz mine, with 100 stamps. The Valinciano mill, with 80 stamps, will soon be completed.

Puebla.

The Tetela Mining Co. has put in a 50-ton steam electric plant with crushers, rolling mills and roaster on its property at Tetela. The property is under the management of R. H. Hutton, with L. Chevrillon as metallurgical engineer.

Sonora.

A rich strike of silver-lead ore has been made in the Santo Domingo mine, near Alamos. A. P. Ballou and F. E. Mills, of Chicago, are interested, with J. R. Hendra as superintendent.

The Zambona Development Co. will soon have a small smelter completed to handle the output of its mine at Minas Nuevas, near Alamos. The company has a 40-ton mill at work, and this is to be increased at once to a capacity of 120 tons. Electric power and lights are provided and hoisting machinery has been put in.

President W. C. Greene, of the Greene Consolidated Copper Co., has issued to the stockholders a report on the company's operations, which says the production of copper from the mines at Cananea, for the five months ending Dec. 31, 1905, was 26,593,931 lb., containing 195,800 oz. of silver and 1,866,941 oz. of gold. Work has progressed rapidly on the ore-bedding plant, which should be completed by March 1. All the material for the first of the reverberatory furnaces being installed is on the ground and this furnace should be ready to blow in about March 20. It is intended to immediately follow with a second furnace of the same capacity of 300 tons per day for treating fines, flue dust and concentrates. Owing to the great increase of sulphur in the ores, fines for these furnaces must be roasted and they will then effect a very large saving in smelting cost, as well as give the company increased production. The four sections of the concentrator are now in operation and the installation of the 72 extra vanners is well under way. This increased vanner capacity will enable higher extraction of copper with but slightly increased cost. An additional water supply is needed at the concentrators to obtain the best results, the Ojo de Agua pump line being taxed to more than its normal capacity. This additional supply can be readily obtained from the Sonora river by duplicating the present pump line. During December, Manager Dwight and Superintendent Harry Kirk visited the Superior iron and copper district to investigate the latest practice in mining large bodies of ore by steam shovels and the caving system. Their observations convinced them that in the ore bodies of the Massey, Oversight and Veta Grande, at a comparatively low cost for the installation of electric tramming, a reduction in the cost of mining from $1 to $1.50 per ton could be made. Preparation is now being made for handling five blocks of ore by the caving system. Owing to the heavy rain and snow prevalent during November and December, a crush occurred in the Capote ore body Nov. 14, causing ignition of the pyrite ore in this mine. All drifts were immediately bulkheaded, shutting off the gases from other openings, and the fire will be allowed to burn until the sulphur in the ore is exhausted. Similar crushes have since occurred in the Massey and Oversight ore bodies by which the drifts opening up these bodies of ore were closed, temporarily shutting off the supply of first-class ore from this portion of the property also. These drifts are being re-opened as rapidly as possible. During the past few months development has shown a large increase in the amount of sulphur contents of the ores and has accentuated the need of roasters and additional reverberatory capacity, as recommended by Mr. Dwight and Mr. Lloyd. Plans and estimates for two batteries of roasters of four each have been prepared, as well as for the second reverberatory furnace.

The new 150-ton smelter of the Transvaal Copper Co., at Cumpas, is to start up this week. F. W. Fink is president and manager.

Personal.

A. F. HOLDEN is at Mexico City.

CHARLES J. ALFORD is in Egypt.

M. P. DALTON, of Denver, is in San Francisco.

D. W. BRUNTON, of Denver, is in San Francisco.

I. N. PEYTON, of Spokane, is at the Palace Hotel.

J. M. CALLOW, of Salt Lake City, has left for Europe.

A. F. STEVENS, of Silver City, Idaho, is in San Francisco.

G. McM. ROSS, of Copperopolis, is at the Occidental Hotel.

W. L. COBB is examining mines at El Tino, Sonora, Mexico.

JOHN B. HASTINGS is examining mines at Leadville, Colorado.

A. F. JONES, of Oroville, has been in San Francisco this week.

A. B. FRENZEL has returned to Denver, Colo., from New York.

O. O. MCREYNOLDS, Denver, Colo., is at Los Angeles, California.

WALDEMAR LINDGREN has returned to Washington from Europe.

J. PARKE CHANNING was at Houghton, Mich., during the past week.

J. E. BAMBERGER, of Salt Lake City, is at the St. Francis Hotel.

DUDLEY BAIRD, of Copperopolis, was in San Francisco this week.

P. A. BABB has removed his headquarters to Gante No. 8, Mexico City.

EDWARD HOOPER has returned to London from Western Australia.

JAS. W. MALCOLMSON has returned to El Paso from Guanajuato, Mexico.

JOSEPH DIETRICK, of Salt Lake City, has opened an office at Los Angeles.

A. J. G. SWINNEY has left London for a year's work in Sumatra and Borneo.

W. R. RUST, general manager of the Tacoma smelter, is at the St. Francis Hotel.

ALFRED JAMES has left London on a tour of Western Australia and New Zealand.

JAS. F. CALLBREATH, secretary the American Mining Congress, is at Salt Lake City.

CHAS. G. GATES is at the Gladstone mine, at French Gulch, Shasta county, California.

C. B. KINGSTON has been appointed manager for Lewis & Marks at Johannesburg.

G. H. BARNHART is manager of the Second Relief mine, near Nelson, British Columbia.

N. B. SPAULDING has resigned as superintendent of El Cubo mine, at Guanajuato, Mexico.

H. R. PLATE, of Denver, is examining mines at Georgetown, Colo., for New York people.

PERCY WILLIAMS has returned to Red Rock, Ariz., from examination of mines in California.

H. L. BROWNE is superintendent San Diego mine, near Santa Barbara, Chihuahua, Mexico.

GEORGE D. KISLINGBURY returned to Los Angeles from Cucurpa district, Sonora, Mex., last week.

A. W. WARWICK has returned to Denver from the Los Angeles mine, at Mina, Chihuahua, Mexico.

GEORGE A. TWEEDY, of Los Angeles, is examining the Bradbury mines at Rosario, Sinaloa, Mexico.

R. S. BOTSFORD has returned to London from Borneo and will proceed shortly to Ashanti, West Africa.

A. C. DART has been appointed engineer for the Newhouse Mining & Smelting Co., at Newhouse, Utah.

FORBES RICKARD has returned to Denver from Pittsburg and Chicago and will leave shortly for Arizona and Sonora, Mexico.

ARTHUR L. WALKER, manager of the Perth Amboy smelter, has arrived in San Francisco, and will remain here a couple of months.

JOHN M. CAMERON has resigned as superintendent Anita Copper Co., and accepted a similar position with the Growler Co. of Gila Bend, Arizona.

FRANK A. SCHRIMER, of Boston, has been elected president of the United Rico mines, at Rico, Colorado. A. B. Roeder was re-elected general manager.

WILLIAM P. BLAKE has severed his connection with the Arizona School of Mines, having resigned the chair of geology. He has resumed professional practice.

H. L. HUSTON has been elected manager of the Logan mine for the Ohio-Tonopah Mining Co., and Overland mine for the Overland Mining Co., with offices at Gold Hill, Nevada.

L. K. FLETCHER, until recently metallurgist for the Progreso Mining Co. of La Paz, has been appointed to a similar position with La Palma Mining Co. at Guatimapi, Durango, Mexico.

H. A. SHIPMAN has returned from Western Australia after an absence of three years. He arrived by the *Siberia* on January 26 and went Goldfield on February 2 to see the new camps in Nevada.

Latest Market Reports.

SAN FRANCISCO, February 1, 1906.

ANGLO-AMERICAN SHARES.

London, February 1, 1906.

	£ s d		£ s d
Camp Bird	1 11 6	Oroville	1 0 0
El Oro	1 7 9	Stratton's Independence	0 8 3
Esperanza	4 17 6	Tomboy	1 10 0
Dolores	2 1 3		

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. February 1, 1906.)

Amalgamated	$114½	North Butte	$ 87½
Anaconda	278	Old Dominion	38¼
Bingham Copper	39¼	Shannon	6⅝
Daly West	17	Tennessee Copper	46
Granby	10	Tonopah-Nevada	18¼
Greene Consolidated	27¼	United States	60¾
Nevada Con. Copper	12½	Utah Copper	33⅛

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 25	Ophir	$6 37½
Hale & Norcross	0 95	Potosi	0 03
Mexican	1 20	Savage	0 48
Exchequer	0 26	Yellow Jacket	0 09

[Tonopah and Goldfield.]

Belmont	$2 90	Montana-Tonopah	$2 72½
Golden Anchor	1 35	Ohio-Tonopah	0 43
Jim Butler	0 86	Red Top	2 00
Jumbo	1 40	Sandstorm	1 45
Kendall	0 78	Tonopah Ex	8 00
Midway	1 87½	West End	1 75

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 65½c. per fine ounce; San Francisco, 65½c.; London, 30 3/16d. (standard ounce, 925 fine); Mexican dollars, 51@53c., San Francisco; 50½c., New York.

COPPER.—New York (by wire, average for week ending Feb. 1), Lake, 18@18.12c.; Electrolytic, 17.75@18c.; Casting, 17.62@17.75c. per pound. Mill copper plates, $21.00; bars, 21@24c. London: £78 10s 0d spot per ton.

LEAD.—New York (by wire, average for week ending Feb. 1), $5.60 per 100 lb; San Francisco, pig, 6.55@6.78c. per lb.; pipe 8@8½c.; sheet, 9@9½c.; London: £16 5s. ℔ long ton.

SPELTER.—New York (by wire, average for week ending Feb. 1), $6.20 ℔ 100 lb.; London, £27 2s. 6d. ℔ ton; San Francisco, ton lots, 7c.; 100-lb. lots, 7¾c.

TIN.—New York, pig, $36.50@36.75; bar tin, ℔ lb., 42¼c.; pig, 39c. London, £166 5s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d.; San Francisco, local, $37.50@39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 33@37c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.50; gray forge, $17.25; San Francisco, bar, 3½c. ℔ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00 open hearth billets, $27.50; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8½c.; less than 500 lb., per lb., 8½c.; in 25-lb. tin pails, ½c. ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ½c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8½c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 14c@15c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8½c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11½c; 14 oz., 10@10½c; 12 oz., 9½@9½c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3¼c ℔ lb.; caustic soda, in drums, 3@3¼c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6½@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17c; Astral, 17c; Star, 17c; Extra Star, 20c; Eocene, 19c; Elaine, 26c; Water White, in bulk, 10½c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24½c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 15½c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 65c; cs., 70c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 53c.; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 57c.

COAL.—San Francisco, coast, yard prices to dealers: Wellington, $7.50; Seattle, $6.50; Coos Bay, $5.50; Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $14.00; Cannel, $8.50; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—98@99% N. Y., $1.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11⅞c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lb. and over at one purchase, ℔ lb., 8½c.; less than 500 lb., 8¼c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., 90c.

URANIUM.—Oxide, ℔ lb., $3.40.

The Carnegie Steel Company, Pittsburg, Pa., recently issued the following:

Schedule of prices which will be paid per ton of 2,240 pounds for domestic manganese ore: Delivered at Lucy Furnaces, Pittsburg, Pa., Edgar Thomson Furnaces, Bessemer, Pa., or South Works, Illinois Steel Company, South Chicago, Ill. Prices are based on ores containing not more than 8% silica and not more than .25% phosphorus and are subject to deductions as follows: For each 1% in excess of 8% silica there shall be a deduction of fifteen (15) cents per ton, fractions in proportion. For each .02% or fraction thereof in excess of .25% phosphorus there shall be a deduction of two (2) cents per unit of manganese per ton.

Metallic Manganese.	Per Cent.	— Prices per Unit — Iron.	Manganese.
Ore containing above	49	6 cents	30 cents
Ore containing above	46 to 49	6 cents	29 cents
Ore containing above	43 to 46	6 cents	28 cents
Ore containing above	40 to 43	6 cents	27 cents

Ore containing less than 40% manganese, or more than 12% silica, or .27% phosphorus subject to acceptance or refusal, buyer's option. Settlements are based on analysis of sample dried at 212° F. The percentage of moisture in the sample as taken being deducted from the weight. Prices subject to change without notice, unless otherwise specially agreed upon.

Trade Treatises.

Bulletin No. 1,019 B, of the Denver Engineering Works Co., illustrates and describes the use of rigid rolls for ore crushing.

The Denver Ore Testing & Sampling Co., 527 Seventeenth street, Denver, Colo., sends a neatly illustrated booklet describing the advantages of preliminary ore testing.

Bulletin No. 1,409, of the Allis-Chalmers Co. of Milwaukee, Wis., contains an excellent illustrated account of the construction and installation of McDougall roasting furnaces.

The Hendrick Manufacturing Co., Carbondale, Pa., have issued their initial catalogue to the general trade on 'Perforated Metals,' a creditable and comprehensive work of 60 pages. Copies will be sent on application.

The Western Gas Engine Co., 908-932 N. Main street, Los Angeles, Cal., have issued a very complete and fully descriptive catalogue, illustrated with numerous half-tone cuts, covering their Western gas engines. These engines are especially designed for Western use and for cheap Western fuel, securing the best results from California distillate No. 2. They range in size from 5 to 500 horsepower.

Books Received.

'Mineral Production of Western Australia,' Bulletin No. 16, by A. G. Maitland and C. F. V. Jackson, contains a summary of mining operations for 1904.

Commercial Paragraphs.

THE American Steel Dredge Works have their complete plant at Logansport, Indiana, in operation.

L. M. WARD, manager Denver office Crocker-Wheeler Co., is in Ampere, N. J., attending the managers' meeting of the company.

THE Denver Engineering Works Co. have opened an office in the Dooly Block, Salt Lake City. Mr. L. G. Bignell will be manager for this district.

THE California Ore Testing Works, of San Farncisco, are adding a tube-mill to their Bay street plant, preparatory to testing a carload of Montana-Tonopah ore, with a view of designing and installing a suitable reduction plant for that property.

L. S. PIERCE, 1653 Welton street, Denver, Colo., manufacturer of the Pierce Amalgamator, reports an order for thirteen 20-ton machines for the Robson & Carter lease on the Smuggler-Union mill at Telluride, Colo. He also reports orders from the Hellan Mining Syndicate, Cleaum, Wash.; Nevada Reduction Co., Dayton, Nev., and Reynolds & Lawson, Grants Pass, Oregon.

THE Allis-Chalmers Co. of Milwaukee, Wis., report having furnished the Granby Consolidated Mining, Smelting & Power Co., Granby, B. C., with a converter stand, complete, with hydraulic cylinder for operating; Frank W. Parker, Quartsburg, Idaho, with a five-foot Huntington mill plant, with steam power, and the Advance Thresher Co., Battle Creek, Mich., with zinc sieving.

Obituary.

R. S. ROBERTSON, who has been in charge of the development of the Annie Laurie claims at Eureka, Utah, was accidentally killed January 2 by falling down a shaft on the Brooklyn-Eureka ground.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JANUARY 16, 1906.

810,365.—PIPE-WRENCH—Henry C. Barlow, Goldendale, Wash.
810,102.—BALING-PRESS BRAKE—Wm S. Bradshaw, San Jose, Cal.
810,260.—FENCE—Sullivan Bugby, Soldiers' Home, Cal.
810,105.—CLEANING COMPOUND—John Callahan, Seattle, Wash.
810,034.—CAN-FILLING APPARATUS—Antonio Cerruti, San Francisco.
810,036.—FOLDING-BED—John E. Chatem, Los Angeles, Cal.
810,045.—WINDOW-LOCK—Elias Etzenhouser and R. L. Morss, San Jose, Cal.
810,331.—STOPPER RETAINING AND EXTRACTING DEVICE—William L. Gallagher, Point Reyes Station, Cal.
809,939.—APPARATUS FOR RECOVERING PRECIOUS METALS—Edward J. Garvin, Portland, Or.
810,146.—COIL SPRING—Eli Hogan, Portland, Or.
810,163.—APPARATUS FOR PRODUCING PERFECT COMBUSTION IN FURNACES—Harry Luckenbach, San Francisco
810,167.—MACHINE FOR AUTOMATICALLY SEGREGATING, MEASURING AND DELIVERING MOLTEN GLASS—Walter D. Morrison, San Francisco.
810,304.—PIPE-WRENCH—Louis V. Remion, San Bernardino, Cal.
810,087.—CARBURETOR—Stephen P. Sanders, Cupertino, Cal.
810,175.—MITER-BOX AND SAW GUIDE—James M. Smith, Wengle, Cal.
810,093.—ENVELOP-SEALER—Lola O. Stassart, Portland, Or.
810,178.—RAILWAY-CROSSING—Richard N. Walton, Los Angeles, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency the following are worthy of special mention:

INTERNAL-COMBUSTION ENGINE.—No. 809,614. January 9, 1906. Henry C. Holloway, Gilroy, Cal. This invention relates to improvements in that class of engines known as 'explosion' or 'internal-combustion' engines. Its object is to obtain a more perfect control for that class of engines which are known as 'internal-combustion' or 'explosion' engines, and in which the expansion of an ignited gaseous vapor acts to impel a piston within a cylinder, and this control is effected by admitting the medium into an independent chamber, wherein it is ignited, and in providing connection between said chamber and the cylinder, with a means for controlling this connection, and thus regulating the speed and power of the engine. It comprises a cylinder having passages at opposite sides, a piston reciprocating in said cylinder, automatically-controlled outlet and inlet valves through which the impelling medium is transmitted by the movement of the piston, a receiver and a combustion-chamber about the same, with a valve between the two and operating in a plane parallel with the piston, and a valve-controlled opening between the combustion-chamber and the working end of the cylinder.

WINDOW-LOCK.—No. 810,045. January 16, 1906. Elias Etzenhouser and Rosannah L. Morss, San Jose, Cal. This invention relates to a device which is especially designed for locking the sashes of vertically slidable windows to each other and also to the casing, so that the sashes may be locked either closed or one or both of them partially opened and rendered immovable when so locked. The invention consists in the combination and arrangement of parts by which the locking may be effected and in the various and necessary details of construction.

CARBURETOR.—No. 810,087. January 16, 1906. S. P. Sanders, Cupertino, Cal. This device comprises in gas machine construction the combination of a tank, a bell therein, a carburetor, a receiver connected with the carburetor, means to reciprocate the bell, an oil-well connected with the carburetor, and means to deliver a predetermined quantity of liquid into said carburetor, said well being of greater diameter in one direction than in the other, and said means for delivering liquid from said well into the carburetor including an elongated bucket supported intermediate of its ends and suspended from the bell, and trip means in the path of the bucket to effect its discharge.

BALING-PRESS BRAKE.—No. 810,102. January 16, 1906. Wm. S. Bradshaw, San Jose, Cal. This invention relates to a brake which is especially designed for use upon baling-presses, and for the purpose of letting the follower down easily when the power has been released. It comprises in a brake mechanism for baling-presses, a follower, a power sweep, intermediate mechanism through which power is transmitted to raise the follower, and a brake whereby the return movement of the follower is controlled, said brake consisting of a shoe, a swiveled yoke upon which the shoe is mounted, a rim eccentrically mounted upon the sweep column, and means for applying pressure to force the shoe against the rim. There are other details of construction combined and arranged to bring about the desired result.

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SAN FRANCISCO, FEBRUARY 10, 1906.

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EDITORIAL.

THE metal markets during the past week have shown a re-actionary tendency, and, while there is a firm undertone, prices have nevertheless drooped, because manufacturers have abstained from making purchases. No serious decline need, however, be anticipated for the present.

WITH this issue we increase our reading matter by two pages, finding that the space hitherto at our disposal prevented the publication of an adequate amount of matter pertaining to the various departments of mining engineering. We hope it will not be necessary further to increase the quantity, but we shall consistently aim to improve the quality, of the matter we publish in these pages.

THAT department of miscellaneous information entitled 'Concentrates' has long been a prominent and much appreciated feature of the MINING AND SCIENTIFIC PRESS. It is our intention to maintain it, and possibly to better it, as everything else worth doing is improved in the course of experience. This week we publish a note on the chemistry of mercuric and lead salts when added to cyanide solutions. It is in response to a query sent to us from one of our readers in Mexico, but it is worthy of the attention of cyanide experts, generally, because it was prepared by one of the best of their own number. Our readers are invited to send questions, especially such as, when answered, would be likely to promote the distribution of useful knowledge.

OUR London correspondent sends us another interesting letter. Among other matters he refers to an amusing example of Jungle finance, for 'jungle' is the name given to the West African department of the mining share market at London. In this case a company with a small capital secures an enormous tract of country and then proceeds to float subsidiary companies with plenty of paper and a minimum of money. These off-shoots of a parent mining company are called 'pups' in Australia, and, like any litter of small dogs, they are exposed to all the dangers of adolescence, some get drowned in watered stock, some get the mange due to a poverty of ore, while others come to violent ends in the course of risky promotions.

MANHATTAN is a good name for anything, whether it be a cocktail or an island inhabited by predatory financiers. It is mentioned often just now because the new gold mining district, which has been christened thus, promises to become important. While the depth of the prospecting shafts is only sixty to eighty feet, the ore is extremely rich—the kind of stuff that carries ounces to the pound. Born late, Manhattan gets the benefit of the experience through which its older brothers, Tonopah and Goldfield, have passed. A real estate boom treads close on the mining excitement, bankers get to work before surveyors have finished and saloons anticipate both, as is proper in a region so arid. It is a poor man's camp; that is, it is the place where poor men, unaided by capital or machinery, may hope to become rich by mere digging, plus intelligent energy. The two Manhattans, one in Nevada and the other sometimes known as New York City, provoke a contrast; we hope the new one will redress the balance of the old, and attain the fame of its namesake, whose inhabitants "see the Atlantic wave their morn restore."

SCRAPPING of machinery is nowhere exemplified better than at Kalgoorlie, in Western Australia. In the course of successive management the bonanza mines have been equipped with a great variety of machines and processes. There has been $4,000,000 spent on machinery at the Lake View Consols, of which there remains the present plant, valued at $600,000. At the Associated Mines there has been expended about $2,500,000, of which $500,000 is represented by the existing equipment. Much of this extravagance was due to the recklessness which accompanies a lavish production, and part of it was due to the refractory character of the ore, inviting new methods of treatment. As there are no foundries in the locality, the accumulation of scrap makes a big showing at Kalgoorlie, and serves as a constant reminder to mine managers that "it is better to be sure than sorry."

A READER of this journal, who sent two mineral specimens for determination to our 'Prospector' department, writes to say that a local assayer of good standing gave him returns of 36 per cent molybdenum in one case and 15 per cent in the other. Both specimens were sent to us and were clearly stibnite, the antimony sulphide, a mineral unlike molybdenite or any other molybdenum mineral. The same assayer found phosphorus, lead and vanadium in the two specimens mentioned. On these results there was a local mining excitement and the owners of the land were besieged with offers, all based on the determinations made by this supposed reputable chemist. It is too often a trick of irresponsible assayers to take advantage of the trust reposed in them by prospectors and to give fictitious results. All of us know of cases where such dishonesty has been eventually detected by sending pulverized brick or barren granite to make-believe assayers, who have found gold and silver where it did not exist. Such men should be exposed, they hurt the real business of mining, and they cast a slur upon an honorable occupation.

Professional Solidarity.

At a recent dinner in New York attended by engineers, the statement was made that the members of this profession were underpaid and would not do better for themselves until they learnt to speak more kindly of one another. This was mainly a reference to the recriminations and jealousies provoked by the conduct of the work on the Isthmus of Panama. There was too much of a tendency to join in aspersing the character of the men who had been attacked by an irresponsible press, and it was the duty of engineers to stand up for those of their own calling; there should be more *esprit de corps.* All of which is true, and we may as well apply it to our own people, the mining engineers, geologists and metallurgists. The characters of engineers are often discussed at clubs, on trains, and in other places where men congregate with the leisure for talking. Occasionally an individual gets rough handling, and less frequently he deserves it, but in the main the biggest harm is done by that faint praise which is the most damnatory and which is most calculated to injure the profession in the eyes of the business community. If a man is dishonest, dishonorable, or flagrantly incapable, the sooner he is labeled rightly, the better; the profession ought to be rid of him, and it usually does shed him sooner or later. But such cases are rare enough; we need more consideration for those who are not altogether successful or abundantly gifted; to these a kind word means a good deal. Most of us have needed encouragement at some time or another; most of us will want it again. Let us be proud of our profession and have a good word for all those who are doing their share in the great work of developing the natural resources of this continent.

Sectional Dredging Machinery.

In our last issue, we endeavored to stimulate a discussion on gold dredging by referring to the methods employed in testing ground by drilling. This week we publish the continuation of an article on this subject. Another important point in connection with dredging is the degree to which it is safe to sectionalize the heavy parts of a dredge. It is obvious that such sub-division must be a last resort. To sectionalize dredging machinery, the chief essential of which is strength, is like dividing a stamp-mill mortar where solidity is the first requisite. The ordinary dredge equipped with 5-ft. buckets employs a shaft and tumbler weighing together about six tons; the shaft, made of nickel steel, is 14 inches in diameter and is 8½ feet long, so that it weighs over a ton—usually about 2,500 pounds. Each bucket-base weighs 1,100 pounds, and even the pins are over a hundred pounds apiece. Obviously, to cut down the parts of such a machinery to the 250 or 350 pounds that a mule can carry, is a difficult matter. The tendency in California is to attain efficiency and economy by building the dredges enormously strong and big. There is a dredge at Folsom—treating 150,000 cubic yards per month—that has close-connected buckets of 13-ft. capacity and another 13-ft. dredge, but of the intermediate or linked bucket type, designed by Julius Baier, has been erected in Montana. Dredges such as these are beyond the transporting capacity of all the mules in creation. The ordinary and, as regarded nowadays, small ma-

chine with 3-ft. close-connected buckets is provided with an 8-inch shaft weighing 1,155 pounds and uses a bucket-base of 475 pounds. Even such a dredge could not be transported over mountainous country. To decrease the burden, the shaft could be worked into the tumbler casting, so that the weight would be distributed into thirds. The bucket-base is difficult to reduce, save by cutting in half, at big expense. This applies to the close-connected type; for a bucket and link dredge of 3-ft. capacity, a six-inch shaft would suffice and the weight would be one-half that given above. By using a built-up bucket-base instead of a solid steel casting each piece can be reduced to 150 pounds; with sacrifice of strength, of course. Such construction will require a pneumatic riveting machinery for assembling the parts. However, these are details beyond our province. We desire merely to stimulate intelligent discussion on the subject and we trust our professional friends will avail themselves of the opportunity.

Fine Grinding.

The contributions of Messrs. Bosqui and Doveton on this interesting subject ought to elicit further useful discussion. A few definitions or, at least, an agreement as to the precise meaning of the terms employed, may prevent confusion. Mr. Henry Louis, professor of mining at the Durham College of Science, has suggested that we use specific terms to describe the various stages of grinding; 'breaking' to be confined to coarse breaking of crude ore; 'crushing' for smaller division by pressure or impact; 'grinding' for comminution by attrition. The idea of technical terms is not to invent new or bigh-sounding words, but to secure precision by giving individual words a particular duty. 'Re-grinding' and 'sliming' are often used interchangeably, but they do not refer to an identical process; re-grinding is an intermediate operation which often precedes the final reduction to slime. Two separate products are made sometimes, as in the cyanidation of silver ores, in the two operations referred to; in other cases, only one product is obtained by a two-stage process. As to 'sand' and 'slime,' we have had a good deal of clever dissection of these terms; the last word of precision was said when slime was defined, by Mr. A. W. Warwick, as a colloid hydrate; but this is the chemist's, not the millman's, point of view. To the millman, 'sand' and 'slime' express a condition and not a theory. Formerly a product of extreme pulverization, so finely comminuted as to be unleachable, was called 'slime.' But we have changed all that; filtering has been so developed that solutions can be forced through material once regarded as impermeable, and slime is wilfully made because the extreme subdivision of particles which it represents is favorable to quick solution in the presence of certain chemicals, such as potassium cyanide.

Slime is no longer an unleachable product. We have returned to the old definition which depended on sizing, and for the moment the arbitrary limit is 150-mesh, simply because that degree of comminution is found by practice to give the best results in the presence of two economic factors, the cost of reducing the size of the particles and the time required for solution of the precious metals. Unless made sufficiently small, the cyanide cannot get at the gold encased in the quartz. Meanwhile 'sand' continues to be the granular product, with sharp edges, readily percolable by solutions. The tendency is to decrease the proportion of this product by re-grinding it to the consistency of slime. Such 'sand' when re-ground to 150-mesh is not 'slime' in the eyes of a microscopist, because the particles are sharp, they are not colloid; but the cyanide expert, who knows all these things, will call this product 'slime' just as much as the clay or mud produced in the first instance from the soft aluminous or feldspathic constituents of the ore. It is 'slime' to him because he gives it the treatment allotted to slime. In other words, 'sand' and 'slime' are two mill products; they are not based on nice chemical or physical distinctions and they serve their present purpose. Anything finer than 150-mesh is slime, anything coarser than 100-mesh is sand, anything between is an accidental by-product. Being based on no true scientific distinction, we expect to see these terms discarded as cyanide practice becomes further developed.

The Debris Problem.

The California Miners' Association is to be congratulated on the effective work done by its president, Mr. Alfonso A. Tregidgo. A copy of the resolutions adopted at the Nevada City convention, in relation to the reclamation of the swamp and overflowed lands by the deposition upon them of the debris made in the course of hydraulic mining, was forwarded to the President, with the request that the Director of the Geological Survey be invited to interest himself in the matter. The response from both has been most cordial and effective. Mr. Tregidgo has received a copy of a report prepared by Mr. C. E. Grunsky, Consulting Engineer of the Reclamation Service. Mr. Grunsky's long experience and thorough acquaintance with the problem in hand gives his views especial weight. His report is strongly endorsed by Mr. Charles D. Walcott, the Director of the Survey, who states that he considers "it would be timely for Congress to adopt a definite general policy of dealing with drainage problems, in order that means may be provided for extending aid where the same is asked for. No satisfactory solution of these problems will be reached unless the work is undertaken by Federal or State Governments." We publish Mr. Grunsky's report in full on another page, for it will prove of great interest to many of our readers, and it marks a great step forward in the solution of a vexatious problem.

The report shows the inadequate results obtained from attempts made on a small scale, by private interests, to reclaim submersible lands along the larger rivers and the impossibility of securing harmonious action among land-owners on a broad scale. It is recommended that the Federal Government show the same consideration for rivers that lie entirely within a single State, such as the Sacramento, as it has shown for those that are inter-State streams, like the Mississippi. The Reclamation Fund is not available for work of this character and special enactment by Congress will be necessary. If then the Federal authorities are put in charge of the work, a comprehensive project would include the delivery of mining debris upon the basin-lands of the Sacramento valley. Furthermore, the California Miners' Association passed a resolution asking the Director of the Survey to prepare a topographic map, to facilitate the selection of localities suitable for the deposition of debris. In return, Mr. Tregidgo has received a map whereon he is asked to mark the portions to be surveyed.

All this is most cheering to those who have a sincere desire to see a settlement of the wasteful feud between the mining and agricultural interests of a State where both mining and agriculture are basic industries, as has been emphasized all along by our best citizens, and notably by Professor S. B. Christy, to whose initiative the present promising conditions are largely due. We do not wonder that Mr. Tregidgo is highly pleased, as shown by the letter which will be found following Mr. Grunsky's report, for he has accomplished a great deal, with the assurance of far-reaching results in the near future. It was the ease with which the Federal authorities were able to condemn land for the purpose of deepening the channel between Vallejo and Mare Island, that suggested the application of similar methods to the impounding of the debris from the mines and the diversion of the slime to the swamp lands. It is obvious that the reclamation work which aims at bringing water to arid regions, possessed of a soil that needs only the beneficent prompting of sufficient moisture, should include the rescue of inundated tracts which need less water and more soil. Meanwhile other good work is being done toward the same end, including an investigation of the agricultural value of the slickens, under the auspices of the Reclamation Department, and at the same time Mr. G. K. Gilbert, of the Geological Survey, is making experiments in the transporting power of waters for the distribution of sediment. All that is needed is the display of public spirit on the part of both miners and farmers, an acceptance of this way out of the wretched tangle that has grown over the quarrels of the last fourteen years and the application of good sense to the solution now offered. Whatever the result, the California Miners' Association is to be congratulated heartily on the service already done to the State.

By the Way.

We continue the observations of Sir William Huggins, on the influence of modern science upon the life and thought of the world. In this part of his address he deals with education, in its broadest sense, as widening the outlook of the individual, and fitting him for citizenship.

Elementary science, taught practically, with the aid of experiment during a boy's early years, cannot fail to develop the faculty of observation. However keen in vision, the eyes see little without training in observation by the subtle exercise of the mind behind them. From the humblest weed to the stars in their courses, all nature is a great object lesson for the acquirement of the power of rapid and accurate noting of minute and quickly changing aspects. Such an early training in the simpler methods of scientific observation confers upon a man for life the possession of an inexhaustible source of interest and delight, and no mean advantage in the keen competitions of the intellectual activities of the present day.

Training in the use of the eyes develops, at the same time, alertness of the intelligence and suppleness of the mind in dealing with new problems, which, in after life, will be of great value in facing unforeseen difficulties of all kinds, which are constantly arising. Science, practically taught, does more, for, under the constant control of his inferential conclusions by the unbending facts of direct experiment, the pupil gradually acquires the habit of reasoning correctly from the observations he makes. In particular, he learns the most precious lesson of great caution in forming his opinions, for he finds how often reasoning, which appeared to him to be flawless, was not really so, for it led him to wrong conclusions. Further, from the constant study of nature, the student comes so to look at things as almost unconsciously to discriminate between those which are essential and those which are only accidental, and so, gradually, to acquire the faculty of classing the facts of experience, and of putting them in their proper places in a consistent system or theory. Are there any other studies, it may be asked, by which, in the same time, a young mind could develop an equally enlarged capacity for correct reasoning and acquire so wide an outlook? Yet, notwithstanding the immense intrinsic value of its teaching, science is but one of the studies which are necessary for a wide and liberal education. Intellectual culture, or, in other words, the whole mind working at its best, requires, besides the training of all its powers harmoniously by the study of nature, an acquaintance with many other kinds of knowledge, especially of human history and the development of human thought, and of the human arts. Humanistic studies and experimental science are equally essential, and, indeed, complement each other. Either alone leaves the mind unequally developed, and its whole attitude one-sided, and so produces a narrow type of mind, which is incapable of taking a wide view of even its own side of thought, and has but little sympathy with any subject outside it.

Improved methods of teaching the classical languages, which would permit of the beginning of the study of them at a later age, would leave ample time for an early training in experimental science, which must soon come to be recognized as an essential part of all education. In future, no grammar or higher schools should be considered as properly provided for unless furnished with the necessary apparatus for teaching experimentally the fundamental principles of mechanics, physics and biology. The pupils should have the use of a small astronomical telescope, and of microscopes for biological work. Such apparatus and instruments can now be purchased at a very small cost. Clearly, it is only by such a widening of the general education common to all who go up to the universities, before specialization is allowed, that the present 'gap between scientific students careless of literary form, and classical students ignorant of scientific method,' can be filled up, and the young men who will in the future take an active part in public affairs, as statesmen and leaders of thought, can be suitably prepared to introduce and encourage in the country that fuller knowledge and appreciation of science which are needed for the complete change of the national attitude on all science questions, which is absolutely necessary if we are to maintain our high position and fulfil our destiny as a great nation.

LODE-FRACTURES.—A late discovery in the Daly-Judge mine affords an illustration of how veins are formed in the depths of the strata, that do not now extend to the surface, as described lately by W. P. Jenney in the MINING AND SCIENTIFIC PRESS. It is related that the manager, John J. Daly, instructed his foreman, by letter, to crosscut south from a certain point on the 1,500 ft. level, in order to develop a known vein. Owing to a mistake, the crosscut was run north into a bar of quartzite at least 500 ft. broad, which in the upper levels of the mine had proved to be barren. After driving a short distance the vein of ore was cut, which was not represented by any fracture worthy of note on the levels above.

CONCENTRATES.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

FOR many years the native silver found in the copper mines of the Lake Superior region belonged, by custom, to the miners discovering it, if they were working on tribute (leasing). Now the companies claim the silver, should any be discovered, as well as the copper.

HYDROGEN PEROXIDE is a good antidote for cyanide poisoning, but the remedy must be promptly and repeatedly applied at intervals of three or four minutes by injecting the fluid hypodermically. Use a 2½% solution. It is also advisable to wash out the stomach with a 2% solution of the same antidote. Very few cases of cyanide poisoning are reported. Men engaged in the business all know the danger, and it is only by accident that cases of poisoning occur.

AN inclined shaft sunk at an angle of 45° gains 70.71 ft. vertical depth in each 100 on the incline. Sunk at 60°, it gains 86.6 ft. vertical depth for each 100 sunk. The vertical depth gained by an inclined shaft varies as the sine of the angle at which the shaft is sunk below the horizon, and the departure of the incline from a vertical line falling from the collar of the shaft is as the cosine of the angle of inclination. Thus, an inclined shaft sunk 100 ft. at an angle of 60° gains a vertical depth of 86.6 ft., and departs 50 ft. from the perpendicular.

THE time for re-setting the carbons in diamond-drill bits cannot be pre-determined. The stones must be reset when they need it, whether 200 ft. have been drilled through or only 20 ft. Ordinarily, when the carbons have been properly set and are of good quality, 40 to 50 ft. of hard quartz should be drilled through without re-setting, and from 150 to 200 ft. of slate. A set of carbons for a 2-inch bit will cost at present prices about $1,000. The stones should be chosen with care by an experienced person, as there is considerable difference in them, both in hardness and freedom from cracks, and a consequent tendency to break up.

IRON pipe for mining operations is not a new thing in the West. In 1857 an iron pipe, 40 inches in diameter, was laid in Yuba county, Cal., near Timbuctoo, for hydraulicking. In recent years, where pipe of large diameter is required, that made of wooden staves has found successful application. The pipe line of the noted water system in Western Australia is of steel and 30 inches in diameter. It is nearly 400 miles long and was built by the Government at a cost of $15,000,000 to supply fresh water to the mines in the desert region about Kalgoorlie. The Homestake Company in South Dakota has laid several miles of vitrified pipe for conveying water.

ROUND mine timbers are usually sold in the West at a stated price for logs, or poles, depending on their diameter at the larger end. In some districts the price is 10 or 12c. per inch of diameter for logs over 12 in. thick and 16 ft. in length. In others the price is regulated by the supply and may be higher or lower than the figure first quoted. Green timbers sell for less than those which have been seasoned, and no logs or poles are accepted that have not been peeled, for these latter rot so quickly underground as to render them expensive at any price. Lagging (split) sells at 4 to 10c. apiece, ranging from 5 to 7 ft. in length, averaging 8 in. wide and 2½ in. thick.

TO ascertain the distance through which a body will fall (theoretically) during a given period of time, square the number of seconds of time and multiply by 16.08 ft., the distance through which the body falls during the first second. The acceleration of gravity is 32.16 ft. per second. An object dropped into the No. 5 shaft of the Tamarack mine, near Houghton, Mich., would require about 18 seconds to reach bottom, provided it met with no obstruction on the way. This shaft is nearly 5,000 ft. deep. In calculating such problems, due consideration must be given the resistance of the atmosphere, which will have a greater or less effect according to the form and specific gravity of the falling object.

A CONCRETE WALL may be built of good materials, and the concrete may be properly mixed and placed in the wall, but if the foundation or earth beneath is soft and yielding, the wall may not prove satisfactory, as, when any weight is placed on the wall, unequal subsidence is almost certain to result, with consequent cracks of the wall and displacement of machinery on structure placed on the wall. Where the underlying earth affords an insecure base the foundation should be broad and well made. It is often a good idea to lay a broad base of large broken rocks, finishing with smaller rock as a floor or base for the concrete, which will aid materially in giving a solid footing to the wall or foundation.

THE Supreme Court of California has held (Hooper *vs.* California, 155 U. S., 648-654) the following: "The right of the Legislature to regulate the transaction of business by foreign corporations in this commonwealth, or to forbid it altogether, is beyond question." It is the policy of the State to merely hold this power in reserve for the purpose of dealing at any time with objectionable foreign corporations, as there is no disposition to bar aliens who conduct a legitimate business within the State. In some instances foreign corporations lease their property to a local company organized for this purpose under the laws of California. Such local concerns are merely dummies, the original company deriving all the benefits, if any accrue.

IN the case of a location notice posted January 1, 1906, on a blacksmith shop situated on the dump of a crosscut tunnel, there is a reasonable doubt in favor of the locator, as he may yet begin work. Evidently this is a re-location, but whether by the original owner or by a stranger the information does not state. The locator (or re-locator) should post his discovery notice on the outcrop of the vein and not 200 ft. away on the blacksmith shop. He should also properly stake (or monument) his location, and it may be his intention to yet fully comply with the law. In some of the States the law requires stated work within 90 days of the date of location; but this, unfortunately, is not the law of California. If within three or four months this locator does not comply with the law as to staking of his claim, etc., the mine itself will then be subject to re-location, as it will then be evident it is not a *bona fide* location. Neither the State law of California nor the Federal law requires any other work than that of staking the claim during the year in which the claim is located.

THE so-called Steamboat Springs of Nevada are about six miles west of Virginia City and at the eastern base of the Sierra Nevada mountains, in a granite region. These springs come up through fissures in the rocks and all the waters are hot, some of them boiling, and clouds of steam may be seen issuing from them at any time, which gave the springs their name. Some of the springs deposit chalcedonic silica, others deposit carbonates of lime, iron, etc., and some deposit sulphur and cinnabar. Several attempts have been made to open a mine on the cinnabar deposit, but it has been found impracticable, owing to the heat generated by the scalding water. The Steamboat Springs have been regarded by some eminent geologists as affording an excellent illustration of how ore deposits generally are formed; but while this is doubtless true of that particular type of deposit, it is unfortunate that investigations have only been possible at comparatively shallow depth. Some years ago considerable cinnabar was mined in a superficial way at these springs and the ore reduced. Gold as well as cinnabar is being deposited by these springs.

THE attempt of miners to identify rocks in the field without knowledge of petrography is almost useless. Only typical rocks can be thus readily determined. Granite and syenite may look much alike. Rocks are classified according to the minerals of which they are composed, and the student must first learn to identify these several minerals unmistakably, and then learn the names of their association. Thus, granite is composed of orthoclase, mica and quartz. Should hornblende replace the mica, it becomes syenite, and the quartz is not essential. Should the feldspar be plagioclase, instead of orthoclase, the rock becomes diorite, and the mica is not necessary; and so on through an almost endless number of minerals, and differentiation in the names, depending on the addition or absence of certain minerals. Structure is also important in the determination of rocks—whether the groundmass is crystalline; coarse or fine-grained; composed of glass or not; showing fluidal structure, and whether containing good-sized crystals of certain minerals. The study of rocks is a branch by itself, a knowledge of which is not indispensable to the prospector, who must search for minerals regardless of their associations and environment.

THE Grand Canyon of the Colorado river is in Arizona, about 70 miles north of Williams, a station on the Santa Fe Railroad. It is about 6,000 ft. deep on the north side and about 4,700 ft. on the south side, the difference being due to the southerly dip of the sedimentary rocks which form the greater portion of the walls of the vast chasm. It is from 12 to 20 miles in width. The topmost stratum is of Carboniferous limestone. The bottom of the greater portion of the canyon is cut down into pre-Cambrian crystalline rocks. In some places lava flows ejected from vents on the Carboniferous platform, or in still later rocks, have flowed to the edge of the gorge and poured over the side into the abyss, a cataract of molten rock, which filled the canyon to a depth of about 400 ft. Through this accumulation of debris the sand-laden waters of the Colorado river has again scoured its way, cutting down once more into the underlying rocks. Ores of copper and gold are known to occur in the crystalline rocks at the bottom of the canyon, and in the limestone and quartzite near the bottom of the sedimentary series, lead-silver ores are found, but the topographic conditions are such that, as yet, little success has attended the efforts to mine in the Grand Canyon.

A DISTINCTION has been made by the courts between the right to enter openly and peaceably within the boundary lines of a previously located placer claim for the purpose of perfecting the location of a previously discovered lode, and the privilege of going upon the surface of the placer for the purpose of prospecting or searching for an undiscovered lode. The Supreme Court of Colorado says that while a stranger may enter a placer location for the purpose of locating a lode known to exist therein, he may not enter for the purpose of searching for a lode which he believes to exist therein, but the existence of which has not actually been proven. —Clipper M. Co. *vs.* Eli M. Co. (Colo.), 68 Pac. 289. Unless the lode be discovered before patent to the placer has been applied for, the lode is supposed to have been unknown. Where a lode claim adjoins a placer, and the owner of the lode desires to take up that portion of the lode which he believes to exist within the placer, in order to make a valid discovery, he should sink a shaft at the line separating the lode claim from the placer claim. If the lode exist at the line it is reasonable to call this a bona fide discovery of the lode within the placer, and if the owner of the placer claim has not yet applied for a patent to the claim the lode locator may stake his discovery of a lode within the placer.

MERCURIC SALTS re-act with KCy to form a soluble double cyanide:

$$HgCl_2 + 4KCy = K_2HgCy_4 + 2KCl.$$

Lead salts, added in excess to cyanide solutions, give a precipitate of basic lead cyanide, but when in small proportion the lead remains in solution, presumably owing to the formation of an alkaline plumbite (K_2PbO_2), by re-action with the caustic alkali present:

$$PbAc_2 + 4KOH = K_2PbO_2 + 2KAc + 4H_2O.$$

The most useful effect of these soluble lead and mercury compounds is the removal, in the form of insoluble HgS and PbS, of any soluble sulphides which would otherwise retard the solution of gold and silver, and which may even re-precipitate silver already dissolved:

$$K_2S + K_2HgCy_4 = HgS + 4KCy$$
$$K_2S + K_2PbO_2 + 2H_2O = PbS + 4KOH.$$

The double mercuric-potassium cyanide also acts as a solvent, attacking gold more readily than simple KCy; and this action is independent of the presence of oxygen, gold replacing mercury:

$$K_2HgCy_4 + 2Au = 2KAuCy_4 + Hg.$$

Silver is similarly dissolved. These re-actions have been amply verified. The action of mercuric-potassium cyanide on gold is the basis of patents secured by Keith and Hood; the latter also claims the use of lead as facilitating the solvent effect of cyanide solutions. De Wilde has a patent involving addition of lead oxide to cyanide solution. These compounds also influence precipitation beneficially if they remain in the solution up to the point of entering the zinc box, as in that case the lead and mercury are precipitated on the zinc, forming zinc-lead and zinc-mercury couples of high electromotive force. In this precipitation the zinc simply changes place with the mercury or lead, as is also the case when the zinc shavings are dipped in lead acetate solution.

THE Homestake mortar has become famous because it embodies special features, the chief of which is rapid discharge. This type of mortar is well adapted to Homestake ores, but of less value with some others. The original Homestake mortar weighed 5,400 lb., was 54¾ in. long, 54½ in. high; feed opening at the back, beginning 6½ in. below the top, was 24 in. long, 4½ in. wide and 7 in. deep. On entering the mortar it remained 24 in. long. At the bottom of the feed forming the continuation of the incline over which the ore fell into the mortar, was a lip 4¾ in. wide and 1½ in. thick, the purpose of which was to discharge the ore against the upper half of the stamp head. The lower edge of this lip was 15½ in. above the bottom of the inside of the mortar. The discharge opening was 15⅞ in. from the bottom of the mortar, outside measurement. It was 48½ in. long and 21¾ in. high, to admit of easy access to the interior of the mortar for placing and removal of shoes, dies, etc., and for cleaning out the mortar. The slot for the screen frame inclined outward at about 10° from the vertical. On the short sides of the discharge opening were channels to receive the screen frame, and the wedges to secure it in place. In all mortars it is important these side grooves should be cast flush with the discharge opening of the mortar. In many mortars the outer edge of this screen groove or channel project inwardly and thus reduce the size of the discharge opening from 1½ to 2 in. on each side, a material loss of efficiency, or capacity, in the mortar to discharge the crushed ore. The bottom, or bed, of the Homestake mortar was cast 7½ in. thick, the sides at the bottom of the inside were 3½ in. thick, the inside length was 50 in. and its width 10½ in. Discharge opening 8 in. above bottom and at that level the mortar had a width of 13½ in. The upper portion of the mortar was but three-quarters of an inch thick. The new Homestake mortars are heavier than that here described and somewhat larger in all dimensions, but the inside measurements are reduced to about the same as those above given by the insertion of steel plates, or liners, on all sides, to prevent the wearing out of the mortar. The advantage of these liners was early recognized and all well-planned mortars now have them, as they give a life of many additional years to a mortar, whereas, formerly mortars would frequently wear out in about five years with constant use. The placing of heavy cast-iron blocks beneath mortars is a new idea, not as yet generally in favor. It affords extreme rigidity, but is also said to be responsible for many broken stems.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

MINING ENGINEERS AND GEOLOGISTS.

The Editor:

Sir—The opinions expressed by Mr. W. H. Storms in the issue of January 20 deal to some extent with the function of the economic geologist in the matter of mining litigation. Mine owners are, unfortunately, occasionally subject to the expense and annoyance of litigation, especially under the extraordinary laws which govern the tenure of mining property in the western United States. The contestants sometimes deem it wise to employ geologists for the preparation of evidence. Fully recognizing the limitations of the geologist in mining practice, limitations to which I have previously had occasion to refer, I would nevertheless protest against the slur on the geologist implied in some of Mr. Storms' statements. The "famous" lawsuit referred to by him in which the occurrence of wulfenite crystals was urged to influence judgment on the case, would seem to be better described as "infamous" than "famous", if the character of the "noted geologist" may be taken as any index of the character of the suit. No reputable geologist would hold such an opinion as he outlines and no man of sense, geologist or not, would attempt to maintain it. Whoever did so would have little regard to his future, either as an honorable man or as a geologist.

One man may be limited by his experience and calibre to the position of the shift-boss; another by his temperament to the career of the geologist. All discussion of the subject, however, must assume that we do not pursue our vocations in defiance of the Ninth Commandment. If we do, our elimination, soon or late, from the fields either of commercial or scientific activity is certain.

What does Mr. Storms mean by the mining geologist? If he indicates by this term a man who is willing to serve a mining company in the way that many criminal lawyers take cases, formulating an opinion arbitrarily which shall be favorable to his clients irrespective of the merits of their case, I must protest that the conception is erroneous, for such a man is not a geologist, mining or otherwise, and could have no standing except in a community lost to venality. The economic geologist enters the employ of the contending party only when conscientiously satisfied that he can establish evidence for his employer in accordance with the tenets of his geological faith, and then fights valiantly to maintain and exhibit his belief. He is worthy of his hire, and whether his efforts result in victory or defeat, he oversteps the bounds neither of his privilege nor his integrity.

C. W. PURINGTON.

Denver, January 29, 1906.

ELECTRICITY VS. COMPRESSED AIR FOR MINE OPERATIONS.

The Editor:

Sir—I have read with much interest the letter of Mr. Edward A. Rix, stating the compressed air side of the above controversy, and I am glad indeed to have such a well recognized authority as Mr. Rix interest himself in this question. I regret, however, that my residence is at such a distance from San Francisco that this letter will probably not appear until several weeks after Mr. Rix's article, thereby putting me at a slight disadvantage and creating the inference that the delay was caused by my having to look up new data on the subject. Such is not the case, however, as it is only necessary to take Mr. Rix's article paragraph by paragraph in order to accumulate all the data that is needed for an adequate reply.

In the second paragraph of Mr. Rix's letter, one is led to believe that an electric rock-drill is some sort of toy, and can only be used in the same way that a 'baby air-drill' would be used. As a matter of fact, there are electric drills now on the market which have demonstrated beyond a doubt their ability to drill at the rate of from 2½ to 3 in. per minute in hard granite, such as is found throughout Colorado. These drills are designed to do the same work, in regard to diameter and depth of hole, that would be accomplished by an air-drill, using a 3-in. cylinder. Such an air-drill, however, would require at least 15 h.p. to operate it, while the electric drill will operate on not more than 2 h.p., or approximately one-seventh the power required for the air-drill. It is, therefore, evident that both are commercially economical, and it is now only a question of which will do the most work continuously for the least money.

The writer has before him a copy of a report, signed by the superintendent of a wellknown mining company, from which he quotes as follows in regard to the work accomplished by the electric drills used exclusively in his mine: "Twenty-five stands were made with the drill, drilling 1,258 ft. in 290 holes, breaking 1,056 cars of rock, making 143 ft. of headway in the main tunnel, at an average cost of $9.74 per foot."

The above amount includes absolutely everything that could go to make up the cost of driving a tunnel, including haulage, repairs, pay-roll, fuel, assaying, powder, and, in fact, all incidental expenses.

Another case which has come to my attention is that of a quarry using both electric and compressed-air drills. In this case an electric drill was working alongside of a 3½-in. compressed-air drill of standard manufacture. The air-drill made an average of 30 ft. per day, requiring from 15 to 20 h.p.; the electric drill made 27 ft. per day, requiring about 2 horsepower.

It is possible to cite numerous other cases of a like nature if space would permit, but I believe that these two are sufficient to demonstrate my contention that a modern electric rock-drill will do practically the same amount of work as a compressed-air drill, while requiring but one-seventh the power. Of course, I am not at liberty to publish here the names of the mine and quarry in which the above records were made, but I shall be glad to convey such information to anyone taking the trouble to communicate with me.

It seems to be exceedingly difficult for compressed-air men to stick to the subject under consideration. You published an article by E. F. Schaefer, giving another view of the matter from the compressed-air standpoint. In this article one is given the impression that it is always necessary to generate electricity at a long distance from the mine. Mr. Schaefer then goes on to show the increased cost in installing dynamos, rotary converters, static transformers, etc., for the handling of high-tension current, and compares this with the cost of installing a compressed-air outfit in the mine itself. He does not say how much it would cost to transmit compressed air to the same distance as the high-tension current.

In order to make a fair comparison, I have prepared the following figures:

COMPRESSED-AIR PLANT. FIVE DRILLS.

Air required = 542 cu. ft. per min.
Horsepower required to compress this air to 80 lb. = 98.

Cost of a straight-line steam-driven air compressor of 600 ft. capacity	$2,000
Five 3½-in. drills and accessories	1,450
Air-receiver, 42 in. by 10 ft.	130
Incidental fixtures	50
1,000 ft. of 4-in. wrought-iron pipe	280
125 h.p. portable boiler	1,200
	$5,110
In case a two-stage compressor were used, at least $500 should be added	500
Making a total of	$5,610

The water rate of the above compressor would be 45 lb. per i.h.p. hour, approximately.

Allowing 9 lb. water evaporated per pound of coal, the coal used per hour would be 490 lb., or, for 8 hours, 4,020 lb. With coal at $4 per ton, the fuel cost of running this compressor 8 hours would be $8, approximately.

In the case of an electric-drill plant, I am informed by a wellknown manufacturer that the following apparatus would be installed for operating five drills:

One 15-h.p. gasoline engine, dynamo and belting	$1,200
Incidental fixtures	50
Switch-board	70
Insulated weather-proof electric wire, No. 00, 2,000 ft.	200
Cost of five drills	3,120
Total	$4,640

The cost of fuel for this plant of five drills, with gasoline at 16c. per gal., is guaranteed not to exceed $2.50 per 8-hour shift.

By comparing the above figures it will be seen that the electric plant is of but one-sixth the power and operates at about one-third the cost, using a more expensive fuel. It must be remembered in this connection, however, that the electric plant provides for enough excess power to light the buildings and headings and to ventilate 1,000 ft. of workings. The installation cost is considerably in favor of the electrical equipment.

Mr. Rix states that compressed air is better adapted to intermittent loads than electricity, and cites the case of a hoist requiring 75 h.p. at the peak, and which does not aggregate for the 24 hours 10 h.p. Mr. Rix contends that if the hoist was operated by compressed air, the compressor would be driven by a 40 h.p. electric motor, the air being stored in proper receivers during hoisting intervals, and the management paying for 40 h.p. instead of 75. This is certainly true; but I think that if an adequate electric-power plant be installed, the hoist could be operated by a single 75-h.p. electric motor, which would only be using power when operating, and that the whole outfit would be less expensive to instal than the apparatus advocated by Mr. Rix, that is, adequate electric-power plant, 40-h.p. electric motor, 35-h.p. air compressor, proper receiver, fittings and a 75-h.p. air motor.

In regard to what Mr. Rix says about the use of good lubricating oil in air compressors, I recently visited a shop in Ohio, where the management was using a low-grade oil for lubricating the cylinders on their air compressor, and they did not know that they were doing anything wrong. It could hardly, therefore, be termed 'criminal' of them, as they did not know any better, and from my experience I am convinced that there is hardly a subject in the mechanical field upon which the average engineer or superintendent possesses so little knowledge as the proper care and management of air-compressing machinery. It would seem to be far more 'criminal' to run even a slight risk of supplying impure air to mine operators when, by the installation of electrical drills and electrically operated blowers, pure and fresh air could be supplied, leakage losses obviated, and the mine operated at a minimum cost.

I must take exception to a statement of Mr. Rix that electricity is more dependent than compressed air upon the courtesy of steam. I believe that any power which can be used for compressing air can also be applied to the generation of electricity, be it Pelton wheel, steam or gasoline engine; in fcta, for mine installations a producer-gas plant, with electrical units driven by a direct-connected gas-engine, forms the most economical motive power which may be obtained. Requiring but one-third the power needed for an air plant, such an equipment can be transported anywhere, as a much lighter engine can be used.

I recognize, of course, that compressed air is adapted to many purposes where electricity can not now be used, such as operating hammers, riveters, and other shop conveniences, but I am convinced that in mines, quarries, etc., electricity will make tremendous strides within the next few years.

W. R. HULBERT.

New York, January 27, 1906.

Mr. Hulbert's quotation of work done by a certain mining company would be more effective if the name, place, and character of rock were given. Nine dollars and seventy-four cents per foot is nothing to boast of, unless the ground was exceptionally difficult. We have had charge of mines where drifts and crosscuts were run for months at a time for $3 to $3.50 per running foot. All quotations of specific performances are strengthened by giving details of name and place; the quarry work described by Mr. Hulbert is interesting, but it is of little value in an argument until someone accepts definite responsibility for the statements. If Mr. Hulbert is not at liberty to publish the names, how is he justified in giving them to anyone who writes to him? It is a discourtesy to the readers of this paper, before whom he is carrying on this debate with Mr. Rix and Mr. Schaefer. As to the criminality of using bad lubricating oil, we engineers have agreed long ago that ignorance of rudimentary facts does not excuse bad work; managers are supposed to know how to safeguard the lives and health of the men in their employ, and if they do not know such an elementary fact as the danger of using low-grade oil in air-compressors, they are unfit for a responsible position.—Editor.

FINE GRINDING.

The Editor:

Sir—I have carefully read the articles of Mr. Voyle and Mr. Doveton in response to my invitation to a discussion, and, judging from the manner in which they have treated the subject, neither gentleman seems to have grasped or realized the conditions obtaining in this branch of ore reduction. Both gentlemen are, apparently, wedded to present standards and not disposed to admit the possibility of further improvement.

As Mr. Doveton speaks authoritatively on the subject under discussion, I assume that he will agree to the following propositions:

1. That coarse gold will take care of itself during its passage through the mill, either by amalgamation or other mechanical concentration, and, as these are the cheapest known methods for the recovery of that character of gold in low-grade ore, there is no necessity to devote further attention to it than is required to free it from its encasing rock and give it an opportunity to concentrate, either in quicksilver or in water.

2. That any gold, coarse or fine, still encased in rock, if not saved by either of the above methods, stands a pretty strong show of landing on the tailing dump unless subjected to further crushing to free it from its covering or, at least, expose some portion of each metallic particle to the action of whatever agent is to be utilized to accomplish its salvation—whether it be quicksilver, or some chemical or combination of chemicals.

3. That in order to totally separate the metal from its casing of rock, unless that casing is permeable by solvents, it must all be reduced in size to that of the most minute particle of metal.

4. That except in extremely rare instances where all conditions are favorable—that is, the ore itself penetrable by solvents; the gold easily dissolved; no appreciable silver content; and no contaminating or deleterious metallic accompaniment — there is no foundation of fact for any such average percentages of extraction as 95% to 97%, which some boast of accomplishing.

5. That, while there is yet, and always will be, room for improvement in the chemical sphere of ore milling, it is, all the same, far in advance of the mechanical branch, as regards efficiency. Perhaps I had better put it this way: That, we can, chemically, dissolve the gold in ore in a very few minutes when ore and gold are finely pulverized—all the gold, if all is liberated from the ore—but we cannot, completely, separate that same chemical solution at all, and only an insignificant portion of it as compared to the whole, in the same time it takes to dissolve the fine gold — a mechanical deficiency, pure and simple.

Mr. Doveton has stated that: "Of the number of

varying classes of ore I have had occasion to examine during my six or seven years' residence in the West, I have met but two or three instances where fine grinding gave an increased commercial extraction of the gold and silver content." Now, as we are after all the facts, or, at least, supporting evidence, and care nothing for assertions that have no foundation whatever, I wish to ask Mr. Doveton (1), what is meant by the term "examine," as used by him in above quotation? Does he mean that he subjected all or even a majority of the gold ores coming under his observation, during that time, to actual and exhaustive milling tests with both methods (fine and coarse sizing)? Or did he "examine" them only by laboratory methods? (2) Whether the ores in question, in a majority of instances, were what are termed gold ores in the sense that most mining men understand that term—eight or ten dollars in gold (if not all gold) to one or two dollars in silver? (3) Why does he hedge himself around with that glib term, "commercial extraction," instead of giving percentages of extraction and actual costs, so we can judge for ourselves regarding the commercial aspect of his operations? (4) From how many different mines did he take those "varying classes of ore?" (5) He says: "In most cases," etc., and it is our right to ask him, how many cases were there in all, approximately? (6) Quoting further, he informs us that: "It may be generally stated that, wherever careful classification is carried out, and absolutely free sharp sand is dealt with by percolation, results equally as commercially good will be attained from the sand as from the slime, though, of course, the treatment of the sand will require probably four to ten times as long as the slime." And it is pertinent to ask him, when did time cease to be a factor—a commercial factor, to use his own ammunition—in ore reduction? (7) If results from the sand will only be "equally as commercially good" as from the slime, are we not to infer that he means "as *profitably*," with present methods of sizing and filtering (by sizing, I mean fineness of division and not classification); and if some quick, cheap method of fine sizing can be devised, would there not be remarkable difference in favor of the fine and slime—in the profit sense? (8) Just as a common-sense, business proposition, would it not be more profitable—ignoring the question of tankage, etc., costs—if, instead of holding the sand in pickle four to ten times as long as is necessary to hold the slime, we were able cheaply to put the sand in condition to respond to the same treatment given the slime, and chuck them out as tailing at the same time? And does he assume that this can never be done? If so, why does he draw a limit to possibilities? (9) Coming down the line, I quote him further, in part, where he says: "In the somewhat rare cases in America in which fine grinding will show a greater profit than average crushing, sand and slime treatment, I am strongly in favor of the grinding pan as a comminutor." Now, regarding these "somewhat rare cases," how did he ascertain the fact of this rarity? Did he test all, or, at least a major part of all the gold ores in America, or know of their having been tested, or does he know that anyone else has?

(10) I shall quote but part of his reference to certain "excavating distributing and conveying" apparatus: "In a skilfully designed plant, sand may be moved from one vat to another, using the above machinery, for approximately one cent per ton, and the extraction and profits enormously increased." This is a most interesting fact, but let me ask him, upon what unit of daily output or capacity did he base such an estimate of per ton expense—was it 10 tons, 100 tons, or 1,000 tons? If upon the first number (10 tons), then on an output of the last number (1,000 tons) he should be able to cut down that one cent several small fractions and, like the Dutchman's bonanza, "split him in two in der middle again," so that the actual cost of handling the latter tonnage would not be worth charging up to expense account at all.

We have now reached the closing paragraph of Mr. Doveton's instructive and authoritative article, and I must quote it in full, because here is where he "puts us back where we belong," by making it plain enough for a basswood man to understand that a great majority of the gold ores of the world require a special process for every mining district, if not for every individual mine, and just how the right kind of a man goes about to reach a just verdict in such a case. He says: "As an instance of the fallacy of attempting to fit the methods of one country to the ores of another may be mentioned the case of Western Australian ores and those of Cripple Creek, Colorado. In the former case, fine grinding is distinctly necessary, to fit the raw ore for the highest commercial extraction, while at Cripple Creek an almost equally good extraction may be obtained at 30-mesh as at 200-mesh, either by bromo-cyanide treatment of raw ore, or by simple cyanidation of the roasted ore. As a matter of fact, a considerably higher extraction may be obtained on the roasted ore at 30-mesh than upon the raw ore, using bromo-cyanide at 200-mesh and finer. The ore in both the above-mentioned districts has points in common, that is, that much of the gold in the material from the lower levels of the mines is combined with tellurium." How deftly and tightly he clinches his points—an artist—in his way. But close inspection reveals the fact that, on this subject, Mr. Doveton lacks a stave or two of being a barrel. I desire to speak directly to Mr. Doveton from now on.

Mr. Doveton, does your illustration contemplate and comprehend and include *all* the *gold* ores of Western Australia and *all* the gold ores of Cripple Creek district? At a rough guess—judging from what I have read and heard in other ways regarding the mining area of Western Australia—I would compare it with the Cripple Creek area in the ratio of about 1,000 to 1.

Now, you are (as you intimate) familiar with all the ores in question and should not hesitate to describe to us the average character of gold ores of both regions and tell us why they are not responsive to the same methods of treatment.

In all your "experience gained in this country, the Australian colonies and Mexico," did you ever, by any possible chance, see two different gold-bearing ores that had *no* "points in common?" That some of the ores of Western Australia (judging from such descriptions as have come to my notice) do contain tellurides in slight proportions, is admitted, but that they are at all comparable, in that respect, I most emphatically deny.

Further, Mr. Doveton, did you ever, in the countries spoken of, see ores *identical* with the sylvanite ores of Cripple Creek, in all constituents, and in a geological or mineralogical sense?

Assuming experiments to have been made as you show them, why did not you, or the other Cripple Creek talent, give the 200-mesh stuff an equal show in a roasted condition?

Mr. Doveton, I, for one, will gladly welcome any suggestion from you that comes inspired by your desire to aid in the betterment of milling facilities, but I protest against the kind of aid you have offered. If you are in lack of a basic principle for study, with a view to accelerating and economizing in ore milling, why not take up the revolving-tube idea which Mr. Voyle has recalled? Or, as you evince a strong liking for the muller grinding principle in ore pulverization, you will find room for the exercise of your mechanical genius. Did it ever occur to you that the ordinary 'combination' pan has about 15 sq. ft. of grinding surface, yet at 70 rev. per min. it cannot, properly, grind to *any* size without screening and returning oversize? Surely it is susceptible of improvement, both as to character of work and capacity. Perhaps, though, you really do think fine grinding a mistake—except "in a few rare instances"—but I am still skeptical concerning the grounds of your unbelief—as expressed.

E. E. WANN.

Los Angeles, January 28, 1906.

ARTIFICIAL PUMICE STONE.—Consul-General Guenther, of Frankfort, reports a German invention by which artificial pumice stone is produced by a mixture of sand and clay. Pumice stone, aside from its use as a cleaning agent, belongs to the most important polishing substances. While emery is used for polishing tools, polishing paper for stone and glass, oxide of iron for fine glassware, and lime for metals, pumice stone is employed for polishing softer articles. Pumice stone as found in nature is, according to its composition, nothing but lava which has received its foam like porosity through the fact that the volcanic stone substance was cooled very rapidly under strong development of gases. Natural pumice stone, which, for industrial purposes, comes almost exclusively from the island of Lipari, is of little firmness, and for that reason experiments have been made for some time to find an artificial substitute of greater durability. This seems now to have been accomplished through a German invention under which artificial pumice stone is made by mixing sand and clay. This artificial pumice stone is made in five different kinds. The first is either hard or soft with a coarse grain and used for leather, waterproof garments, and for the felt and woolen industry. The second can also be supplied hard or soft. It has a medium grain and is mainly used for stucco and sculptural work, as also for rubbing wood before painting. The third is soft, of fine grain, and is recommended for polishing wood and tin. The fourth is of medium hardness and fine grain and gives to wood the right polish before being finished with oil. The fifth is hard and of fine grain and used for polishing stone, especially lithographic stone. The manner of using is the same as for natural pumice stone. For wood it is first used dry, afterward mixed with oil.

THE general composition of the crust of the earth has been calculated as closely as possible on the basis of known chemical analyses; among the elements given, only the following appear which are metals of importance as such in every-day life: aluminum 8.13, iron 4 71, manganese .07, chromium .01 and nickel .01. They rank, respectively, in the table, third, fourth, thirteenth, sixteenth and seventeenth. Of the five, iron is the only one of marked prominence. No one of the remaining four is comparable for usefulness with at least five other metals which are not mentioned, namely, copper, lead, zinc, silver and gold.

Mine Drainage at Joplin.

Written for the MINING AND SCIENTIFIC PRESS by W. R. CRANE.

The drainage of mines is not seriously considered until much water is encountered at considerable depth, and even then the influx of water must be excessive, or the mineral of low grade, to prohibit its ejection, with modern equipment, readily and at comparatively small cost. The drainage, for example, of the shallow workings of the Joplin lead and zinc region, would be a simple problem, were it not for several exceptional conditions, namely, the highly fissured condition of the formations and the extreme acidity of the mine waters.

The highly fissured condition of the quartz and limestone formations permits free ingress of surface water and an even more ready passage of underground waters, which may be set in motion by depressions in the surface of the water-level by an individual pumping plant or the combined pumping of a group of mines. The ease with which surface water can enter the mines is readily demonstrated by the rapid rise in level of the water in shafts and workings after a heavy and especially protracted rain-storm; also, a visit to a mine, the workings of which lie directly beneath the tailing pile of a concentrating mill, still further demonstrates, by the constant drip and drizzle, the ease with which the water can find its way to considerable depths and in a surprisingly short period of time. Careful estimates of the amount of water that enters the mine, from the concentrating mills alone, have been placed at fully one-third of the total amount there employed, and as, in many instances, the source of the mill-water is in the mine, it means an endless round of operations—pump to the surface, run back again and so on *ad infinitum*.

Further, mines situated along the valleys of rivers and creeks are usually dry until a rise in the stream carries it over the level of the sand-packed bed, when a general flooding of the mines results. It is a common occurrence to discharge the water pumped from a mine into a stream, only to raise the level of the water in an adjoining mine and ultimately have a good share return to the former mine. So thoroughly is this condition of underground circulation understood that it is customary, in those parts of the district where mines are closely grouped together, to install a pumping plant, the operator of which receives a royalty on every ton of ore mined. Centralized pumping plants are of common occurrence in the district.

As an instance of the flooding of mines situated in the valleys, or bottom of rivers and creeks, the condition of affairs on Short creek, at Galena, may be cited. Here many rich pockets of ore were discovered during the early days, but mining operations never extended deeper than 50 or 60 ft.; they were really little more than surface workings, owing to the periodic flooding occasioned by the creek overflowing its banks. There is little doubt but that much valuable mineral still remains in this locality, and close to the surface at that. Many attempts have been made to carry the water of the creek past certain properties in wooden flumes, but with temporary success only. Some years ago a flume was erected and was doing good service, when a railroad pile-bridge was built just above its mouth and diagonally across the waterway, which so obstructed the stream that when the first high water came, the bottom was flooded and the flume partly destroyed. Damage suits were instituted, but a compromise was made—the railroad reconstructing the flume, which is now in excellent condition, although the mines have not as yet been freed from water. See Fig. 1.

The presence of much pyrite in the ore, and often in considerable quantities outside the orebodies, is responsible, by dissociation and solution, for the acidity of the mine-waters. So extremely acid is the water of many localities that no metal or alloy can resist its ravages for any great length of time. Metal pumps, with copper, brass, bronze, and similar linings, have, at best, a life of only a few weeks or months, while the wire and perforated metal screens of jigs and trommels often last but a few days. Recently opened mines and new localities are, as a rule, not seriously troubled with acid water, but such a condition soon develops.

As indicated, the question of drainage is not simply one of removing the water from the mine, but also of removal to such a distance as to insure its not returning by an underground route to the mine. To conduct the water away from the immediate vicinity of the mines, pipes, launders and flumes have been tried, and in a few instances tank-cars have been employed. The question of a systematic and united attempt to put into effect a system of drainage has been seriously considered, but has not materialized.

Aside from the use of buckets and tanks, the Cornish pump was first employed to free the mines from water, and it may be considered as an important factor in establishing the operations upon a profitable basis. The low first cost of the Cornish

pumps, combined with their simplicity of construction, ease of installation, and adaptability, have been largely responsible for their wide and universal use. They are still the standard pumps of the district and will probably continue to be employed for depths not exceeding 300 feet.

The comparatively recent activity in deeper mining has shown the existence of much larger quantities of water than were encountered in the shallower workings, and, after increasing the size of the Cornish pump to what was considered the economic limit (16 in.) without getting the capacity required, the more modern steam-pumps were installed. Pumps of the Snow, Worthington, Gardner and Emerson types are now employed in the district, and, where the water is not too acid, they are giving excellent service at low running cost. Steam-pumps with 5 to 7-in. discharge pipes are common, while a 16-in. pump will shortly be installed on a property near Webb City. The capacity of steam-pumps ranges from 500 to 3,500 gal. per minute.

Centrifugal, belt, and various forms of rotary pumps are employed in shallow workings, and especially in maintaining the water supply of the mills. These pumps are especially subject to corrosion by acid water, owing to the gradual concentration of the acidity, due to evaporation in the impounding ponds, and, in spite of the employment of various kinds of metal linings for casings and rotary parts, they are of extremely short life, seldom more than 30 to 45 days, and often less. As a last resort, wooden casings were employed, the only portions of the pumps that are metal being the rotary parts and the stuffing-box bearings. Wooden column pipes are occasionally used, but have not proved a success, especially the metal-bound stave pipes, owing to the corrosion and breakage of the binding wires and bands.

Notwithstanding the drift in practice toward the more economically operated types of pumps, the Cornish pump must still be considered the standard pumping mechanism of the district, and although the surface arrangements, that is, the methods of driving, may be changed, it still remains the old Cornish pump of our forefathers.

Owing to the shallowness of the workings, only the single-stage or bucket form has been employed. That portion of the pump in the shaft consists only of a pipe which can readily be set in one corner or to one side, and thus occupy a small space. The pump proper is simply an extension of the column pipe and is commonly known as the 'working-barrel.' The separate parts of the pumping mechanism, from the extreme lower end of the system upward, are: The suction, which consists of the screen and sleeve (for extending the suction); the clock valve, at the top of suction pipe; the working-barrel, which is a section of pipe (usually of cast iron) carefully dressed within, or lined with a bushing, to insure a close fit for the lift-valve operating within; and the column pipe, usually cast iron, and in lengths of 5, 10, 15 and 20 ft. All joints are provided with gaskets and well bolted together, the whole being placed in the shaft and rigidly supported at the surface, and at as many other points as is deemed necessary. It is not uncommon to see as great a length as 150 ft. of pipe supported from the surface, the upper end of the pipe being supported by clamps and beams (See Fig. 3), while the lower end has a chain attached to it, which in turn is secured at the surface. The top of the column pipe is often expanded into a funnel, which flares out around the rod; large quantities of water can thus be introduced into the pump quickly for the purpose of priming.

Operating within the column pipe is a wooden rod, which is made up of lengths of pine timber, 4 by 4 in. or 6 by 6 in., usually the former. Connection is made between the ends of the sections of rods, as shown at A and B, Fig. 3, while connection is made with the lift-valve through the rod, C, which is commonly known as the 'spear' or 'snake.'

The rods are actuated by means of walking-beams, angle-bobs and cross-heads, all of which are in common use, although the walking-beam and cross-heads are preferred, especially the latter. Single pumps, actuated by a walking-beam, are widely used, and, where excessive quantities of water are encountered, double-beam or bob-pumps are often installed side by side, as shown in Fig. 2. The walking-beams of these two pumps are driven by the same engine, through a train of gears and belt. These pumps have been in service six or eight years, and, although the driving mechanism is considerably the worse for wear, they are still in commission and are doing satisfactory work, which is rather remarkable, seeing the scant attention that is accorded them. Working data for these pumps are as follows: Size of column pipe, 12 in.; length of stroke, 6 ft.; number of strokes per minute, for single pump, 12. The volume of water discharged by the two pumps filled a launder, 24 in. wide, 3 in. deep. The walking-beams are provided with counter-weights and are supposed to be balanced, but a casual observation of their working makes it apparent that, in most cases, the greatest expenditure of power is on the up-stroke, or when the pump is raising water, the engine racing between strokes.

Fig. 2. Double Walking-Beam Cornish Pump.

Within the past four or five years, the cross-head form of Cornish pump, sometimes known as the 'Neosho cross-head,' has been introduced, and is extensively employed at the present time. The advantages claimed for this form of rod-drive are: The rod is given, and maintains, an upright position and does not sway back and forth as in the walking-beam forms, thus necessitating long arms for the rod-supports, in order that the rods shall not rub against the column pipe; the reversal of the rod is quicker, thus permitting a larger number of strokes, which may, however, be a positive disadvantage if carried too far, a breakage of rods and spears will result, if the reversal is too quick; the small amount of space occupied, allowing one or more pumps to be readily placed side by side in the same shaft or compartment, and conveniently attached and supported by the members of the head-frame; and, lastly, ease of operation.

The balancing of a single pump is easily accomplished and, when two pumps are employed, they may be so connected as to counterbalance each other. The following is a brief description of a single counterbalanced, cross-head pump, and illustrates present practice in construction and method of operating such a pump in this district. See Fig. 3. The column pipe, with discharge head N, is supported at the top of shaft, on the shaft-collar, as shown at E; the rod R has the working-valve attached to it and is then lowered into the pipe until the valve enters the working-barrel, when it is set at the proper position with respect to the same. The upper end of the rod R is then clamped into the cross-head H, which slides up and down on the guide rods Z, which in turn are rigidly fastened to heavy cross-timbers, as shown at G. Attached to the cross-head, but on the side opposite the rod, is pivoted the pitman J, the lower end of which is connected to the crank L. The crank-arm has three holes spaced 6 in. apart, thus permitting an adjustment of strokes from 4 to 6 ft. Fastened to the upper end of the pitman J, by means of a wrought-iron strap S, bolted securely to the casting I, is a $\frac{5}{8}$-in. wire rope, which passes upward and over an 18-in. sheave F, thence downward to the weight M. The weight M acts as a counter-weight for the rod and friction of the moving parts of rod, cross-head, valve, etc. Three views of the cross-head (top, side and front) are shown at H, H_1 and H_2. The crank D is mounted upon a journal bearing a large spur wheel, often made 6 and 8 ft. in diameter, which is driven by a small pinion of 12 to 14 in. diameter, which in turn is driven by a belt from the driving engine. The train of gearing, which is known as the 'gear,' is mounted upon a heavy frame of timber and securely fastened to the same, and may be attached to the cross-head guide-support.

It is claimed that, when properly balanced, the pumps will run smoothly on 10 lb. of steam, although a pressure of 80 lb. is usually maintained, owing to the fact that the same boiler furnishes steam to both pump and hoisting engines. The cost of operating such a pump is rather uncertain, owing to the overlapping of different operations, as hoisting, pumping, tramming, etc. Further, it may be operated only a few hours a day and seldom requires the constant attention of an attendant. The operating expense is moderate, although not as low as for a steam-pump under similar circumstances. These pumps are readily dismantled and as readily assembled again, which is an important point, when we consider the uncertainty of the character of labor that must be depended upon. The cost of the pumps is slight, that of the metal parts seldom exceeding $50 to $75, and, as the timber-work is extremely simple, the total first cost is almost negligible when compared with steam pumps for the same service.

It is probable that the single lift, or bucket Cornish pump, will still continue to be standard in the Joplin region, especially where acid waters are found. It is interesting to note the modifications and improvements made to render these pumps more serviceable and efficient for the work in hand. Under existing conditions, it is doubtful whether a more inexpensive, simple and easily operated pump can be found to take its place.

Fig. 1. Flume at Galena, Kansas.

THE PROSPECTOR.

The mineral sample from Iowa Hill is calcium sulphate (gypsum).

The rock from Coffee, Cal., is apparently a much altered grano-diorite.

The ore from Seattle, Wash., marked H. A. I., is stibnite (antimony sulphide).

'The Prospector' cannot make determination of the sample from Paris, Kern county, Cal. It is simply pulverized quartz containing sulphides. 'The Prospector' makes no assays.

The mineral specimens from Leete, Nev., are: No. 1 is a silicious hematite, incrusted with the potassium iron silicate glauconite. No. 2 is a granular mixture of kaolinized feldspar and scales of chlorite.

The peculiar mineral from El Dorado, Cal., said to ooze from the rocks, and supposed by the owner to interfere with amalgamation, is a soluble sulphate of alumina and sodium.

The rock sample from San Francisco, marked 1,000, is rhyolite tuff, of no value, except possibly locally it might be used as building stone in structures of moderate height.

The rock from Waldo, Or., is an altered pyroxenite. The metallic-appearing mineral is pyrrhotite.

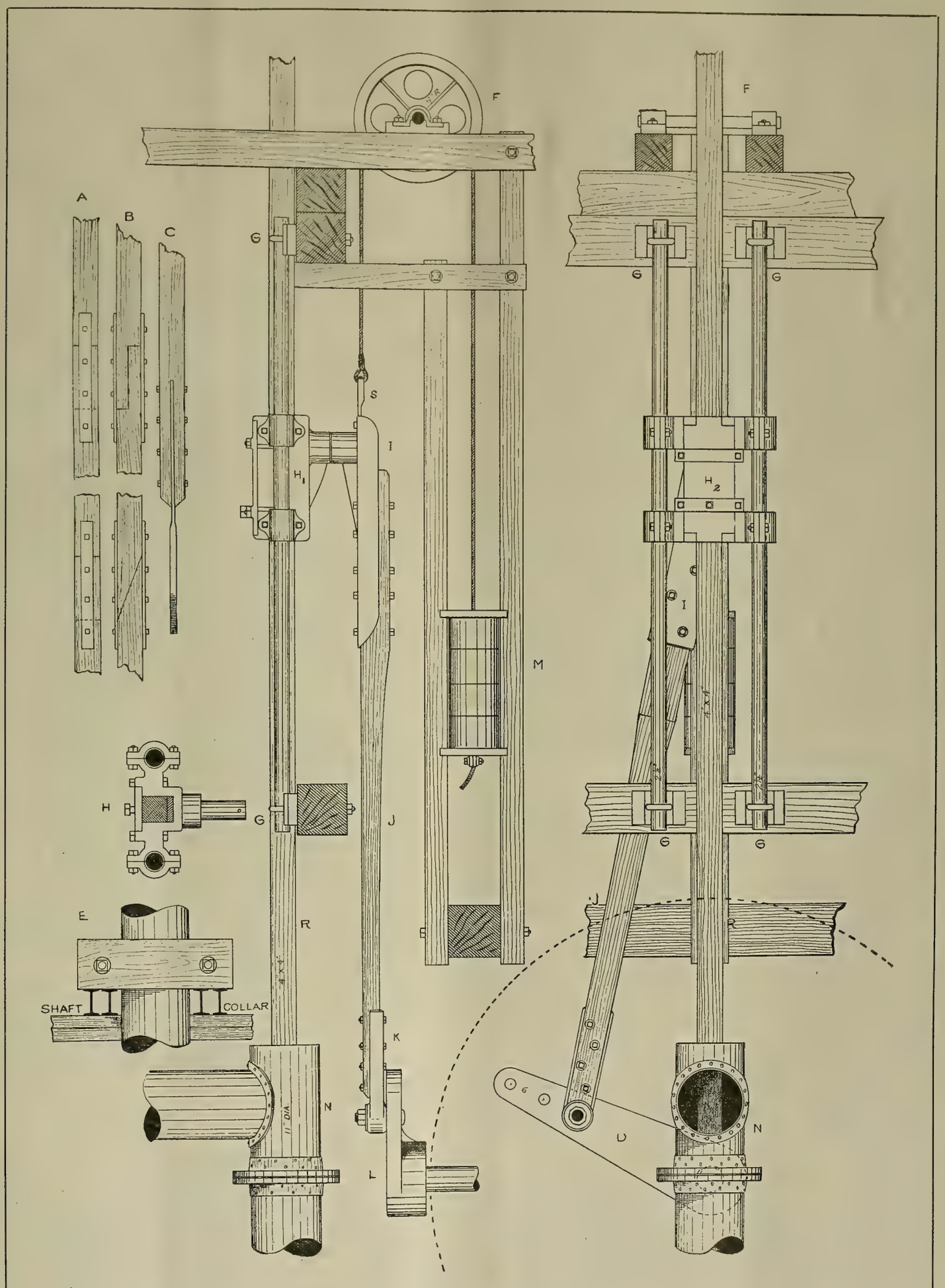


FIG. 3.—A CROSS-HEAD CORNISH PUMP.

The Debris Problem.

On our editorial page will be found a statement of the steps proposed to be taken to advance the settlement of this old trouble in California. Expectation of success is founded upon the goodwill of the President and the Director of the United States Geological Survey, with the co-operation of the Reclamation Service of the Government. The following is an important letter elicited by the President of the California Miners' Association, whose comment is subjoined.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
RECLAMATION SERVICE,
WASHINGTON, D. C., January 16, 1906.

To the Honorable Chas. D. Walcott, Director of the Geological Survey:

Sir — In response to your request for my views on the resolutions adopted by the California Miners' Association at its annual convention recently held at Nevada City, California, I desire to say that the swamp and overflow lands of the State of California were ceded to that State by the United States in 1850 for the purpose of reclamation. These lands in California, as in other States, were disposed of by private parties under laws intended to encourage their drainage and reclamation either by individual owners or by co-operation of owners under district organization when a number of tracts owned severally appeared susceptible of reclamation by one system of works.

Under these laws, attempts to reclaim lands along the larger rivers have been mainly directed to the construction of embankments or levees, which serve as barriers to the spread of the water. Protection work of this character has generally been constructed at the sole expense of land owners. Some State aid has been extended as in California, and in some cases, as along the Mississippi river, the work done by the United States has been a material feature of the land protection work. The measures thus far provided have led to only partial success. Proper attention has rarely been given to the drainage problems. The works for local benefit have gradually restricted the natural water-ways and submersible areas, and this reduction of water-way, which has in some cases been aggravated by other causes, has forced the flood plain above its original height and has added to the difficulty and expense of further land protection. This is the situation in California at the present time. The natural main drainage lines, though re-enforced by levees, are inadequate to carry the floods to the sea. Hundreds of thousands of acres are still submersible at ordinary flood stages, and other hundreds of thousands of acres, though in a measure protected, are subjected to dangers which make their cultivation possible only at a great risk. These lands are all privately owned. It is not a question of improving a part of the public domain.

Harmonious action by the land owners has in the past been out of the question, mainly due to the vastness of the areas which should be included in single drainage projects. Those who believe themselves favorably located prefer a partial protection, according to their own ideas and at their own expense, to a participation in one comprehensive project. Disasters have been so frequent under this system that efforts are being constantly put forth for relief. One project after another has been suggested, but thus far without satisfactory result. There seems to be no general agreement that the main difficulty lies in harmonizing conflicting ideas relating to the best course of action.

It seems reasonable that rivers, such as the Sacramento river, which lie entirely within a single State, should be entitled to the same consideration by the Federal Government, as the rivers, such as the Mississippi, which are inter-State streams, and it would be eminently appropriate and proper for Congress to adopt the same general plan of treatment for rivers of the former class, thereby aiding and facilitating the work of land reclamation.

The impression seems to prevail among the interested parties in the Sacramento valley that the United States may upon a further investigation undertake a plan of river rectification on a larger scale than contemplated in the past, which, while improving the navigability of the water ways in the Sacramento valley, will at the same time fit in with a general drainage product and materially reduce the cost thereof.

The view that further investigation, looking to a broader treatment of the question, is justified, led Congress to include in an Act approved March 3, 1905, the following:

"The Secretary of War is hereby authorized and directed to appoint a board consisting of three engineers of the United States army (one of whom shall have had experience on the Sacramento river and two on the Mississippi river) for the purpose of making a general examination of the Sacramento, San Joaquin and Feather rivers, California, and their tributaries, and of consulting with any engineers, commissioners or officers who have been appointed by the State of California to determine the method of controlling the overflow of said rivers and their tributaries, with a view of considering what, if anything, the United States can or should do in conjunction with said State to improve the navigation of said rivers and their tributaries, and the probable cost to the United States of such improvement."

The Sacramento Drainage district has been formed by legislative enactment, approved March 20, 1905. The law creating this district, in making provision for the assessment of the property in the district to meet the cost of works, proportioned by benefits conferred, conditions this assessment upon a contribution by either the State of California or the United States, or by both. By suitable authority "the proportion to be borne by said district and the State respectively of the cost of constructing and completing the works" is to be determined. No part of the district assessment "shall be called or collected until the State of California and the Government of the United States, or one of them, shall have made an appropriation or other legal provision for the payment of the balance of the sum to be expended jointly with said district in performing the work according to the plans recommended by said report of said engineers, or such supplemental, amended or other plan as may be approved by the State Board of Examiners." The report here referred to is the report of Engineers T. G. Dabney, H. B. Richardson, H. M. Chittenden and M. A. Nurse, filed with the Commissioner of Public Works of California on December 15, 1904.

Whatever is done by the United States or by the State for the amelioration of conditions as now prevail in the submersible areas adjacent to such rivers as the Sacramento river will result primarily in direct and material benefit to the owners of the land. It will result in indirect financial benefit to the State and to the United States, and in general benefit to the Nation, by adding to the resources of the country.

The report of the Board of Engineers which has been authorized as above stated may lead to an appropriation by Congress, which can be used in the construction of works for the improvement of drainage and navigation in Sacramento valley. If it does, and if by such means the drainage district is enabled to make progress along the lines marked out by the State law, there will be no call for Sacramento valley for such assistance in the matter of drainage as it is believed could, with benefit to all concerned, be extended, if Congress should pass laws for reclamation by drainage similar in their scope to the Reclamation Act.

But in the other event further aid from the United States will be sought—and the time will soon be at hand when a course of action in such cases must be definitely marked out.

A wise, sound and safe policy to be adopted by the United States in cases where land is to be reclaimed by drainage would be to assist:

First, by outlining drainage projects and supervising their execution.

Second, by advancing the funds required for the execution of each approved project, all money thus advanced to be returned to the United States Treasury in a series of years upon completion of the project.

Third, by waiving interest on money invested by the United States in such reclamation work.

The fundamental principle should be that the cost of reclaiming lands and protecting property from damage by floods should fall upon the land reclaimed and upon the property protected in proportion to the benefits conferred.

Action by the United States in any special case, if such a policy be adopted by Congress, pre-supposes request by the land owners for such action. No project should be carried out without a satisfactory pledge that the cost of the work will be returned to the United States within 20 years. Under such conditions as prevail in the Sacramento valley, the reclamation work by irrigation might well be united with that of drainage, but the work there would be of such magnitude and should be carried forward with such energy that the utilization of the reclamation fund for this purpose is entirely out of the question. This fund has already been allotted practically to its limits.

The attention of Congress might, therefore, with propriety at this time be called to the benefits which would result from a law substantially on the lines of the Reclamation Act, authorizing drainage projects to be examined and works for drainage to be constructed. Suitable provision should be made in such law for combining irrigation work with drainage so that comprehensive drainage and irrigation projects, similar to that for Sacramento valley, would come within the scope of the law.

It will then be for the property owners of Sacramento valley to determine whether, all circumstances considered, they should rely upon the district system for an amelioration of the drainage conditions, or whether they should conform to the prescribed regulations and requirements and let the work be carried out by the United States Government.

The Reclamation Fund, as above stated, is not available for work of this character, not even for preliminary examinations and surveys which must precede the approval of any project. In any law which Congress may pass to facilitate land reclamation by drainage, provision should, therefore, be made for setting apart a special fund to meet the cost of the reclamation works of approved projects.

If such a law be enacted, it should authorize the Secretary of the Interior to make necessary examinations and surveys, and should place at his disposal and make immediately available not less than $200,000 for this purpose.

If drainage works are to be carried out in Sacramento valley on the lines now approved by State authority under co-operation of the United States, the State and the drainage district, then at the proper time the problem of disposing of mining debris on some of the overflowed lands of the valley may properly be called to the attention of the engineers who pass upon the final plans of the required works.

If, on the other hand, Federal authorities are put in sole charge of the work, then the examination of any comprehensive Sacramento valley project would necessarily be extended to and would include all such features as the delivery of mining debris upon the basin lands of the valley. Very respectfully,

C. E. GRUNSKY, Consulting Engineer.

The President of the California Miners' Association sends us the following letter, commenting upon the above report:

Now, my mining and agricultural friends, it is evident that the one and only thing for us to do is to have a number of representative men from the valleys of the Sacramento, San Joaquin and Feather rivers, meet a joint number from our Association and settle on a united plan of action, so that our Senators and Congressmen at Washington may be able to act in conjunction with each other for the benefit of us all. It is further evident that the President is heart and soul with us in California, and it is for us to settle our difficulties at home, and then to ask the Federal Government for what appropriations we need, and he will assist us.

Further, that my humble opinion is that the Federal Government, having sold to the farmer his land, and to the miner his mine, should take care of *both* industries for the benefit of the miners and farmers directly and the State and Nation indirectly. And as certain overflowed lands, known as the Vallejo Water Front, owned by private individuals, have been condemned and purchased by the Federal Government for the purpose of deepening the channel between Vallejo and Mare Island—so should the Federal Authorities be put in *sole* charge of the drainage works of the Sacramento, San Joaquin and Feather River districts, and condemn and purchase such lands as their engineers recommend for a dumping ground for the mining debris from the mountains. The barrier is all right and will become stronger as it progresses toward completion. This will hold back the coarser debris from the gravel mines that deposit into the Yuba. It is in the watershed of this river that the most valuable gravel deposits at present known to exist are situated. It would be an easy matter to construct a canal capable of carrying the finer debris, such a canal to be taken out at a suitable point above the barrier, and depositing the debris on that portion of overflowed land recommended by the Government engineers for condemnation and purchase; at the same time, this canal could be paved with blocks, similar to those formerly used in hydraulic mine bedrock tunnels, and by the introduction between these blocks of sufficient quicksilver, the amount of gold saved would pay the biggest kind of interest on the money appropriated for the entire work of reclamation, drainage and barriers—no matter what the amount should be. Let the United States do this, and capital from all over the United States—aye, the whole world—will be forthcoming to enable the miners to repair the damage done by the enforced idleness of the hydraulic mines. California will soon double her gold output. The worthless overflowed lands will become fertile, and the Sacramento river will have ocean steamers running to Red Bluff.

Let us come together as soon as possible, and talk this matter over, say at Marysville. I ask for a committee to be appointed by the Valley to represent their interests and promise that our executive committee will immediately appoint a like number to meet them there to represent the mining interests. We will leave the number to the discretion of each side, the convention to be held not later than February 20.

ALFONSO A. TREGIDGO,
President California Miners' Ass'n.

San Francisco, February 5, 1906.

THE production of aluminum in the United States has increased nearly tenfold in as many years. Two reasons explain this phenomenal growth—economic production, which has initiated low prices, and increased consumption, especially in the electrical industry. The output in 1904 was 8,600,000 lb. When it is remembered that the industry dates its beginning from 1883, in which year the production was 83 lb. only, its rapid development will be appreciated. It was not until 1891 that the output reached 100,000 lb., but from that date the output has been phenomenal. Aside from the electrical industry, in which aluminum is gaining favor as a substitute for copper conductors for the electric transmission of light and power, there has been expansion in other directions. The steel industry has become an important consumer of aluminum.

Mining Methods—I.

Written for the Mining and Scientific Press by W. H. Storms.

One of the things that is noticeably characteristic of the successful mining engineer is his ability to adapt his methods to new and unexpected conditions. The methods by which mineral is extracted vary greatly, depending upon the character and size of the deposit; its position—whether vertical, flat or inclined; the topographical situation, and upon many other conditions, each of which has a bearing upon the economy of mining operations.

It is not my purpose at this time to enter upon an exhaustive dissertation of mining methods, but to refer briefly to mining practice in California.

In those districts where the veins are comparatively small, and the wall-rocks hard, as, for instance, at Grass Valley and Nevada City, the mining methods are like those used elsewhere under similar conditions, but in the Mother Lode region, and more particularly in that portion of it where the walls are slate—either one or both walls—peculiar structural conditions exist which require special methods.

On the Mother Lode of California—where the veins occur between walls of clay slate, or where one wall is of this character of rock—upon the removal of the vein, in shaft, or drift, or other cutting, the slate usually begins to exfoliate, as it were, and to swell, and if the encroachment of this swelling mass of rock is not relieved by cutting it away and removing the debris in cars, it will in time, and often in a surprisingly short time, fill the cutting completely. In some instances the slate is hard and apparently firm when the cutting is first made, but in from one to three weeks it begins to slowly thrust itself against the posts and lagging of the timber sets, and slabs scale off where not prevented by timbers, and fall into the drift. Nor can timbers, or any method of placing them, yet devised, hold this swelling ground in place. In some places the vein quartz is accompanied by slate which has been reduced by pressure and movement to a mass of fine foliated on pulverized material, commonly called 'gouge' by the miners. In character, this gouge ranges from a scaly, half-coherent mass to the consistency of putty or clay. Often the sides are clay-like and leathery, while the center consists of foliated scales, mingled with fragments of quartz and calcite, and occasionally with pyrite. Not infrequently, the entire fissure is found filled with this gouge material, the quartz being absent; but this portion of the fissure must be passed through, for the purpose of exploration or to reach orebodies known to exist beyond. In passing through such heavy ground, it is the practice to timber heavily, but it has been learned by costly experience that it is useless to lag the sets tightly, it being the better plan to allow ample space between the lagging, that the swelling ground may work through these open spaces and be picked away by miners detailed to look after this work. It has been found less expensive thus to relieve the pressure upon the timbers, preserving the main sets in alignment and preventing the breaking or crushing of the main members of the set. In this manner the expense of maintaining drifts, and other openings, is reduced. The method is applicable to both the sides and top of the drift, but where the bottom of the drift swells, raising the track from a few inches to several feet, as it frequently does, the only way the grade can be maintained is by cutting away the bottom of the drift and lowering the track to grade. In many instances this has to be done repeatedly, and it is not known to the writer that any limitation of this "continuous performance" has yet been reached on the Mother Lode in California.

Not infrequently the methods at present in vogue in this region appear not altogether the best that could be adopted. There is noticeably a constant conflict between the conservative policy of having development advanced sufficiently to insure abundant 'ore in sight,' and thereby assure continuous milling operations for a considerable period (ordinarily a wise and commendable policy), and the expense necessary to keep open a great length of drift, raise and stope, in this heavy swelling ground. Between these two elements in the economy of mining, the superintendents of some of the most important mines on the lode have fought the battle for years, but, even yet, there appears to be no general agreement as to what method is best adapted to existing conditions, and each manager attempts to "work out his own salvation" along the lines which his experience suggests is the most expedient under the circumstances.

The miners of the Mother Lode are not unprogressive; on the contrary, they are constantly on the outlook for that which will aid in their work, cheapen costs, and produce better economic results. Still, it seems possible that in some matters a change might be made in mining methods for the better—better, in that it would accomplish all that is at present being done, and in that it would probably lessen cost and also reduce the element of danger to the workmen.

How necessary it is to adopt some system of mining which will in the end be less expensive may be suggested by the knowledge, that in a prominent mine on the Lode a contract was let to drive a drift 200 ft. Experienced miners took this contract at what they considered a good price for breaking the ground and removing it, substantially timbering the excavation. They drove about five feet daily, but before two-thirds of their contract had been finished they were obliged to re-timber a considerable portion of that first completed, and the result was that they scarcely made day's pay, where they had anticipated not less than $6 per day. They knew what they could accomplish in a shift, and figured liberally, but entirely overlooked the probable necessity of re-timbering a goodly portion of their contract before it could be finished. They had never before assumed a share of the responsibilities of the superintendent.

In another instance a shaft sunk on the fissure, within three years from the time work began, had to be almost wholly re-timbered, and from four to six men are now constantly employed in relieving ground, wedging timbers into line, or replacing them, in this shaft; and, in nearly all the shafts sunk in the fissure, when in slate, on the Mother Lode, the superintendents have a similar experience. The two instances cited will render more clear the necessity for some change in mining methods, which will reduce the ultimate cost of mining on the lode.

Most of the difficulties of the managers in this region arise from the demand for prompt returns, on the part of stockholders, and an apparent abhorrence to pay for dead work—work performed in the mine not immediately productive of profitable results. This has led to the short-sighted economy of the present system of mine development and operation. It is only within recent years that shafts have been sunk in the country rock, instead of on the fissure, of the Mother Lode. The first large shaft to be sunk in the wall was that of the Argonaut, an incline now about 2,000 ft. deep. This shaft was started in the hanging wall, but at about 300 ft. cut the vein and continued in the foot-wall for nearly 1,000 ft., when the vein, in its changing dip, again intersected the shaft. The Oneida, the Kennedy, and the Gwin mine each have vertical shafts started in the hanging wall, and each of them, except that of the Kennedy, has intersected the vein in depth. The wisdom and ultimate economy of shafts sunk in the country rock on this lode had long since been demonstrated in the case of each of the several shafts above mentioned. In a few instances lateral drifts have been run in the foot-wall of the vein in some of these Mother Lode mines to avoid the expense of maintaining a gangway in the fissure, and in these instances also the economic advantage of driving drifts in barren country rock has been shown.

The several exceptions to customary mining practice have suggested the advisability of making a systematic change in the development of these mines, with a view to ultimate economy, although accomplished at somewhat greater initial cost.

Cyanide Sores.—These painful affections may arise from two principal causes; first, from dipping the hands or arms into cyanide baths to recover articles which have dropped into them—a very common practice and much to be condemned; and, second, from the accidental contact of the fingers or other parts of the hand, on which a recent cut or scratch has been inflicted, with cyanide solutions. In the former case, independent of the constitutional mischief which may arise from the absorption by the skin of the cyanide salts, the caustic liquid acts very freely upon the delicate tissue of the skin, but more especially upon the parts under the finger nails. We have known instances in which purulent matter has formed under the nails of both hands from this cause, necessitating the use of the lancet and poulticing. Again, when cyanide solutions came in contact with recent wounds—even very slight cuts or abrasions of the skin—a troublesome and exceedingly painful sore is sure to result, unless the part be at once soaked in warm water; indeed it is a very good plan, after rinsing the part in cold water, to give it a momentary dip in a weak acid pickle, then soak it for a few moments in warm water, and after wiping the part dry with a clean rag or towel, apply a drop of olive oil and cover up with a strip of thin sheet of gutta-percha. —A. Watt in *Electro-Deposition*.

Electric Furnace.—The future development of the electric furnace requires marked additions to our knowledge of refractory materials. The success of various existing furnaces and the failure of many others may be attributed to the quality of the linings, and the secrets which certain manufacturers guard are those which relate to the refractory construction. Much attention is, therefore, being directed to the study of materials capable of withstanding the highest temperatures without decomposition or fusion. Magnesia, which, where suitably shrunk, is perhaps the most refractory compound known, has received much attention, and we have been informed recently that magnesia in the form of tubes and other shapes may now be obtained.—Chas. F. Burgess in *Electrical Review*.

Origin of Klondike Gold.

There is little doubt that the Klondike gold is detrital in origin, and has been derived from auriferous quartz veins cutting the schists of the Klondike series. The veins are small and the number destroyed and concentrated as pebbles and boulders in the valley-bottoms is almost incalculable. The high-level 'white channel' gravels have a volume, on Bonanza and Bunker creeks alone, of nearly 500,000,000 cu. yd., and nearly half the deposit consists of quartz grains, pebbles and boulders derived from veins. This figure, large as it is, represents only a fraction of the vein material destroyed, as the volume of the gravels was originally at least a third greater, and a further allowance must be made for the large percentage of quartz ground up and carried away. The total production of the camp will probably approach $200,000,000; the average gold tenor of the quartz, therefore, did not exceed a few cents to the ton.

The derivation of the placer gold from quartz veins, as pointed out by Spurr in regard to the Fortymile district, is evident from the character of the grains. The greater part of the gold occurs in irregular flattened discs and bulbs similar to those in the veins. Many of the grains and most of the nuggets enclose quartz, and a few are themselves enclosed in quartz. Pebbles and boulders specked with gold are also occasionally found. A boulder from Bonanza creek, near Discovery, weighing 60 oz., contained 20 oz. gold. Additional evidence of the detrital origin of the gold is afforded by its worn character in the creeks, while the younger grains and nuggets found in the gulches are always rough and angular. The richest quartz, so far discovered, occurs near the head of Victoria gulch, a tributary of Bonanza creek. The partially decomposed slide-rock, which covers the surface of the hillside below the quartz outcroppings, contains colors of gold, and it is significant that Bonanza creek is rich below the mouth of Victoria gulch, and practically barren above. Victoria gulch is itself gold-bearing, and the gold obtained from near its head is sharply angular. It is not inferred from this that all the gold in Bonanza creek came from Victoria gulch, as none of the heavy gold has traveled far, and the valley was probably repeatedly enriched from veins along its course and from the older gravels; but that some of it was so derived seems certain.

While the greater part of the placer gold has been derived from broken quartz veins, a small percentage may have been precipitated from water carrying gold in solution. A boulder was found in one of the workings on Miller creek, the upper surface of which was partially covered with thin specks and scales of crystalline gold. The crystals were arranged in a dendritic manner. Some of them were firmly attached to the rock and others separated easily from it. The angles of the crystals were sharp and showed no wear of any kind, while the boulder itself, quartz-mica schist, was well-rounded. The gold evidently did not belong to the rock originally, and the only explanation of its occurrence seems to be that it was taken up by some solvent and re-deposited on the surface of the boulder. A number of thin specimens of nearly unworn crystalline gold, often dendritic in structure, have been found on Eldorado and other Klondike creeks, and they may have originated in this manner. The bulky, octahedral crystals (the common crystalline variety) were probably derived, like the nuggets, from veins. Several specimens of these have been obtained from the Victoria gulch quartz.

Quartz veins are exceedingly abundant in the schist of the Klondike series, and also occur, but more sparingly, in the Nasina schists and in the Moosehide diabase. The veins, as a rule, are small and non-persistent, varying in size from mere threads up to masses of quartz 100 to 200 ft. in length and from four to six feet in width. Large veins occur occasionally, one on the Yukon river, below the mouth of Cariboo creek, measuring over 30 ft. in width.

The common vein of the district is generally lenticular in outline, the lenticles, in the majority of cases, measuring only a few inches in width and a few feet in length. The larger veins swell out, in places, to five or six feet, but are seldom traceable for any distance. They follow the planes of schistosity, or cut them at a small angle. In some instances, while the strikes of the vein and the enclosing schist nearly coincided, the dips proved to be in opposite directions. Branching veins are not uncommon, the branches often cutting directly across the schists.

The metallic contents of the quartz veins present little variety. Iron is usually present in the form of pyrite and, less frequently, magnetite, often in sufficient quantities to give the vein a rusty color when weathered. Copper pyrite and galena, the latter sometimes argentiferous, occur less frequently, and free gold has been found in a number of veins, occasionally in considerable quantities. A short lens of quartz found near the head of Victoria gulch was studded at one end with numerous grains and small nuggets of gold, some of them well crystallized. The gold occurred mostly at or near the surface, very little being found in the interior of the vein. Small veins carrying grains of gold have been discovered on nearly all the producing creeks.—R. G. McConnell, *Geological Survey of Canada*.

The Prospecting and Valuing of Dredging Ground.

Written for the MINING AND SCIENTIFIC PRESS by NORMAN C. STINES.

(*Continued from page 70.*)

The Log-Book.—It is in the records that the engineer finds his data for valuing ground. The log-book as kept by different men varies, but for practical utility I have found the accompanying to be best; Table 1 is a page from a log-book as kept by a panner. All linear dimensions are in feet and tenths. At the head of the page is placed the number of the hole as drilled and the number as recorded in the transit-book. Following this is the name of the tract on which the hole was drilled. In column 'A' we have recorded the depth to which the casing has been driven. Everything on the same horizontal line as that refers to that foot in the section of the ground. This is measured by the machine-man and recorded by the panner. In column 'B' we have the depth of core after driving. This is a measure of the amount of material which has been forced into the pipe by the last drive *plus* the core left in the pipe before driving. It gives the panner an idea of the kind of ground to expect and occasionally it indicates the character of bedrock. In drilling ground in which the bedrock is volcanic ash (such as that at Oroville), a large core after a hard drive is a very good sign of bedrock. Its importance, however, lies in the fact that it acts as a check on the amount of material coming into the pipe. Column 'C' is also important. In it we can see if the bit has been below the casing and at what point. If we see that it has been below and has found an abnormal amount of gold for that pumping we can be sure that something was wrong—some gold has run into the pipe. In this hole the bit is never below the casing except after the casing has been driven 0.5 ft. into bedrock. The reason for this is that the machine-man is under orders to cease drilling while there is yet 0.3 ft. of core in the casing. There is only one reason for the bit to be below the casing; the ground is so *tight* or so coarse that the casing will not drive unless the ground is loosened below the casing. And in no case where the ground is drilled below the casing should the material be pumped before the casing is again driven deeper. This core is to act as a plug to prevent any material from outside the limits of the shoe from running into the casing. Its length will depend on the ease with which the ground runs. In sand a larger core is required than in gravel. The proper length of core to leave can only be determined in the ground itself and will vary not only for different holes but for different depths in the same hole. This must be regulated by the man in charge.

The length of core left in the pipe before driving should always be such that only the right volume of material will be forced into the casing. By the right amount is meant that amount which corresponds to the volume of a cylinder one foot long and 7½ in. diameter at the base. This amount, when forced into the pipe, should be somewhat longer than one foot, as it has been reduced at the base to a circle only six inches in diameter. This cylinder, to have the same volume as the one of larger cross-section, not allowing for the expansion due to the loosening of the gravel, would be 18.7 in. long, or 1.555 ft. But only in those cases where the ground is classed as 'very firm' does the length of core approach this value. (See column 'B' for the following feet: 15–19 and 27–30.)

In column 'D' is placed the core after pumping, and its importance in one way has been shown. Its further importance will be indicated later. In column 'E' is placed the depth of the hole. It is obtained by subtracting the core in 'D' from the depth of the casing as seen in 'A.' It is the least important of all, and is only retained as a convenience.

In column 'F' are recorded the estimated amounts of gold, which are classified as explained above and are reported by weight, not by number of colors. For example: 3^7 means that seven milligrams of No. 3 gold was found in that pan; 2^9 means nine milligrams of No. 2 gold and 1^{18} indicates 18 milligrams of the largest size were in the pan. This estimating of weights tells a great deal more than the mere number of colors. It is remarkable how expert a man will become in estimating the gold, especially in the smaller sizes. In looking at the log-book one can immediately tell how the ground is running and how many cents it will pan per cubic yard. Each milligram of gold per running foot means that that foot corresponds to ground of a value of 6c. per cu. yd. For example, in the 15th foot the panner recorded two milligrams of gold and one immediately knows that that corresponds to 12-cent ground; in the 17th foot there were 11 mg. or that ground was 66-cent ground.

This value is obtained thus: Each running foot means 0.01 cu. yd. Therefore if we get one milligram from 0.01 cu. yd., from a yard we should get 100 mg. and as a gram of gold (as ordinarily found in the gravels of the San Joaquin and Sacramento valleys) is worth about 60c., 100 mg. is worth six cents. This method of recording weights emphasizes the occurrence of pay-streaks much better than that of recording colors only.

TABLE I.

A ft.	B ft.	C ft.	D ft.	E ft.	F Gold Contents.	G in.	H hr. min.	I	J	Remarks.
4.7	2.5	0.3	0.3	4.4	— — —	1.00	7–56	Loose.	Soil.	M. Blk. S.
6	2.1	0.4	0.3	5.7	— — 3^1	1.00	8–04	Loose.	S. F. G.	"
7	1.5	0.3	0.3	6.7	— — 3^T	0.75	8–24	"	"	"
8	1.5	0.5	0.5	7.5	— — 3^2	0.75	8–32	"	"	L. Blk. S.
9	1.7	0.3	0.3	8.8	— — 3^1	0 75	8–42	"	S. Md. G.	"
10	1.8	0.3	0 3	9.7	— — 3^3	0.75	8–50	"	"	Sm. Blk. S.
11	1.8	0.5	0.7	10.3	— — 3^6	1.00	9–03	Firm.	S. C. G.	"
12	2.9	0.7	1.2	10.8	— — 3^4	1.50	9–16	"	Sand.	M. Blk. S.
13	2.7		0.5							
14	2.8	0.6	0.5	13.5	— — 3^5	2.00	9–47	"	S. C. G.	Sm. Blk. S.
15	1.8	0.4	0 4	14.6	— — 3^1	1.00	9–59	"	"	"
16	1.8	0.3	0.3	15.7	— 2^2 3^3	1.00	10–20	V. Firm.	C. G.	Sm. Clay.
17	1.8	0.3	0 3	16.7	— 2^6 3^5	1.00	10–42	"	"	Sm. Garnets.
18	1.8	0.4	0 4	17.6	— — 3^4	1.00	11–12	"	"	"
19	1.8	0.3	0.4	18.6	— — 3^T	1.50	11–20	Firm.	S. C. G.	Sm. Blk. S.
20	2.5	0.6	0.6	19.4	— — 3^T	1.50	11–31	"	Sand.	"
21	2.0	0.5	1.0	20 0	— — 3^4	1 50	11–43	"	S. F. G.	"
22	2.2	0.7	0.6	21.4	— — 3^3	1.75	11–56	"	"	"
23	1.8	0.4	0.3	22.7	— — 3^T	1.00	12–40	Loose.	F. G.	"
24	1.5	0.3	0 2	23.8	— — 3^T	0.75	1–05	"	"	"
25	1.6	0.3	0.3	24 7	— — 3^1	0.75	1–17	Firm.	Md. G.	"
26	1.7	0.3	0.3	25.7	— — 3^3	0.75	1–23	"	C. G.	Garnets.
27	1.8	0.3	0.3	26.7	— 2^2 3^6	0.80	1–45	V. Firm.	"	"
28	1.8	0.3	0.3	27.7	— 2^3 3^6	0.75	2–03	"	"	"
29	1.8	0.4	0.4	28.6	— — 3^2	0.75	2–33	"	"	"
30	1.9	0.3	0.5	29.5	— — 3^6	1.50	2–51	"	"	"
31	2.3	0.5	0.7	30 3	— — 3^2	1.50	2–57	Loose.	S. F. G.	Sm. Blk. S.
32	2.2	0.6	0.6	31.4	— — 3^T	1 50	3–07	Firm.	Sand.	"
33	1.9	0.5	0.4	32.6	— — 3^T	1.25	3–14	Loose.	S. F. G.	"
34	1.7	0.3	0.3	33 7	— 2^6 3^9	1.00	3–26	Firm.	C. G.	Garnets.
35	1.9	0.4	0.4	34.6	1^6 2^9 3^{12}	1.00	4–10	V. Firm.	C. G. & Bedrock.	
10–26–'04.										
36	2.3	0.5	0.5	35.5	1^{27} 2^{18} 3^{18}	1.00	7–25	"	Bedrock.	
		—1.0	—1.0	37 0	— 2^6 3^8	0.50	7–32	Soft.	"	
		—2.0	—2.0	38.0	— — 3^4	0.25	7–40	"	"	
		—3.0	—3 0	39.0	— — —		8–00	"	"	

Fig. 1.

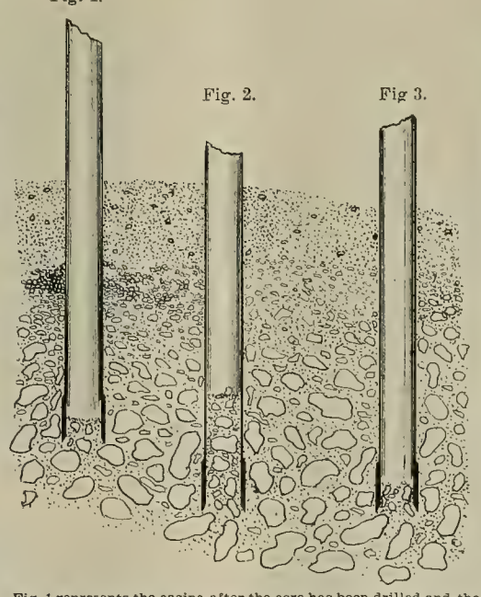


Fig. 2.

Fig 3.

Fig. 1 represents the casing after the core has been drilled and the drillings pumped out. The blocks are then put on and the casing driven one foot.

Fig. 2 represents the pipe with the core in it just after driving, and before drilling.

Fig. 3 is the same after the core has been drilled and dumped, and the casing made ready for the next drive.

In column 'G' is recorded the amount of material obtained by pumping, as measured in the pan. It is a rough check on the volume extracted and its use is shown later. In column 'H' is given the time of each pumping. It helps to afford an idea of the stiffness of the ground by a measure of the time it takes to drive, drill, and pump a foot. In column 'I' is recorded the character of the ground in regard to its tightness. Ground is classed as 'loose,' 'firm' and 'very firm.' 'Loose' ground is that which can be drilled and pumped at the rate of one foot every 5 to 9 minutes; 'firm' ground would be such as required from 10 to 14 min. for the same operations, and 'very firm' that which required a longer time. In column 'J' is recorded the formation as passed through. This is classified under the following heads: Clay, sand, cemented material, fine gravel, medium gravel, coarse gravel and large boulders.

Under the head of remarks almost anything important or unusual is recorded. This would include the amount of black sand, the occurrence of amalgam, etc. Here also would be mentioned anything peculiar about the gold such as its lightness, both in weight and color, and the occurrence of flour gold. The delays, with their causes and lengths, would also be stated here.

Table 2 is the summary which follows each hole. It is self-explanatory. The water-level is measured during, or after, the casing is pulled. If there is no danger of the ground caving, this is left till but one joint remains in the ground. If there is any danger of the ground caving, the measuring is done after each joint is pulled.

I think I have shown how the drill and its record can be made to answer all of the first four questions, with the exception of the value of the land and the

TABLE II.

Hole No. 29.	C_2	W. J. Smith's Tract.
Commenced hole	7 a. m.	10–25–1904
Finished drilling	8 a. m.	10–26–1904
" pulling	9:47 a. m.	10–26–1904
" hole	10:05 a. m.	10–26–1904
Depth of hole	39 ft.	
" to bedrock	35.5 ft.	
Character of bedrock	Soft white tuff, much slime	
Depth of soil	4 ft.	
Water level from surface	14 ft.	
Total colors	1^{33}, 2^{52}, 3^{119}, 204	
Gold in box	— — 3^1	
Gold in tails	— — 3^4	
Pay-streaks	8–18, 21, 22, 25–31, 34–38	
Delays—cause and length		
Length of pipe—No. 1	6.5	....
2	6.1	12.6
3	4.8	17.4
4	5.3	22.7
5	5.7	28.4
6	5.6	34.0
7	5.1	39.1
Sand	5, 12, 20, 32	
Clay	— — — —	
Cement	— — — —	
Fine gravel	6–8, 19, 21–24, 31, 33	
Medium gravel	9–10, 25	
Coarse gravel	11, 13, 18, 26–30, 34, 35	
Loose gravel	5–10, 23–24, 31, 33	
Firm gravel	11–15, 19–22, 25–26, 32, 34	
Very firm gravel	16–18, 27–30, 35	

REMARKS.—A great deal of sand occurs mixed with gravels and in places there is enough water to cause the ground to run.

Calculated volume	0.38 cu. yd.
Volume by cores	0.45 cu. yd.

contour of the bedrock. These are obtained by the use of the records in the log-book with those obtained in making the surveys. By running a line of levels over the holes, and using the depth to bedrock a found in the log-book, the contours of the bedrock can be established.

Calculating Values.—In figuring the value of the ground one must be certain of the volume of material from which each sample came. It is the lack of this knowledge which has caused most of the errors made in valuing ground by the method of boring holes. The volume of a hole excavated as described is not that of the inside of the casing, but is the volume of a cylinder whose length is the distance from the surface to bedrock, or as deep as pay goes, and the area of whose base is the area of a circle 7.5 in. diam., that is, the diameter of the shoe. If no ground has run into the pipe, we can use what is called Radford's factor, that is, 0.27. This is used in the following way: Multiply the depth in feet by 0.27 to get the volume in cubic feet. To reduce to cubic yards divide by 27. To simplify matters, divide the depth of the hole by 100 to get the volume in cubic yards. This factor was obtained by experiment in one case, and apparently does not take into consideration the possibility of any other material, not belonging to that cylinder, running in. This ground that has run into the pipe carries gold and must be taken into consideration in figuring the volume from which the sample came.

The weight of the gold from the hole in Table 1 was 184 mg., or approximately 11.04c.; the volume for 38 ft., according to Radford's factor, was 0.38 cu. yd.; therefore, the value of a cubic yard is 29.05 cents.

In looking at the cores in column 'B,' it is seen that they differ for the different formations drilled. For

example, compare the cores in columns 'B,' 'C' and 'D' for the following feet with those of any of the others: 11, 12, 13, 19, 20, 21, 22, 30, 31 and 32. In 'B' they are larger than ordinary and in places in 'D' we see that the core after pumping is greater than before. There is only one conclusion; the ground is running into the pipe and here we are getting more than is represented by a cylinder 38 ft. long and 7.5 in. diam. This must increase the volume, and it certainly increases the gold obtained, as can be seen by looking at column 'F.' This increase in volume must be taken into account or else the increase in the amount of the gold will give a false return.

By a careful use of the core-lengths recorded and the volumes given in 'G,' the volume of the incoming ground is obtained thus: Opposite the 11th foot the core after pumping is 0.7 ft. and before it was only 0.5 ft.; clearly a running-in of 0.2 ft. Then, too, in column 'G' we get one pan of material where we have only been getting 0.75 pan before. That shows that a little more was pumped than was to be expected by the core after driving.

Again in the 12th foot we have a running-in of 0.5 ft. after pumping, and to begin with we had 2.9 ft. core where we did not look for more than 2.2 ft.; therefore, for this foot alone, we have a running-in of 1.2 ft. By going down all of the cores we see that there has been a running-in of about 5 ft. Then by looking at the pans we see a greater amount of material than was to be expected from the cores. For this hole this amounts to about another two feet; that makes an extra 7 ft., or the hole corresponds to a depth of 45 ft. and the volume would be 0.45 cu. yd. Using this as our basis of valuation of the ground, we get an average of 24.5c. per yard. This is about 15% lower than the yield we found above and I think is much nearer the true value. Such a difference would destroy the valuation of a large deposit.

Of course, all holes do not contain running ground and where they do not, there is not the need of making these modifications. For this class of ground this form of log-book seems to record the facts better than a simpler type. As one cannot tell when running ground is to be encountered, this form of notes should be used all the time.

Final Calculations. — The average value of the ground for the whole area is obtained in the following way: Multiply the average yield of the ground for each hole by its depth in feet; add these products and divide the sum by the sum of the depths. The volume is obtained as soon as the area is known and the average depth over that area. The gross value of the deposit is then found by multiplying the value in cents per yard by the total number of yards. The net value is obtained by subtracting from the gross value the cost of the land, the cost of working, and the loss in tailing. These will differ under different conditions and in different parts of the country.

Cost of Drilling.—Drilling costs vary from $1.40 to $3.50 per ft., with an average of $2.50 per ft. The costs per day are divided about as follows:

Machine-man		$ 3 50
Panner		3 00
Fireman		2 50
Roustabout and team	4 00 to	5 00
Superintendence	3 00 to	7 00
Wood	3 00 to	5 00
Repairs		3 00
Rent		5 00
Total	$27 00 to	$34 00

A machine will make from 12 to 40 ft. per day; it is impossible to give an average, as it varies in different parts of the State.

Changing Tools.

Value of Tests.—Drilling followed by dredging, as at Oroville, has shown that only about 75% of the yield shown by drilling has been recovered. To test the value of these tests one acre was drilled with 23 holes and the dredging returns produced bullion worth 95% of that shown by the drilling results. In another case, a boat dredged only about 35% of the gold as shown by the drilling, but in this case there were only two holes per acre. It is plainly seen that the more numerous the holes the more accurate is the sampling. With care and a careful superintendence of the drilling, there is no reason why these results should not be fairly accurate; they can always be checked by the sinking of shafts preparatory to the commencement of actual dredging.

Discovery of Cyanide.—Scheele, in 1783, laid the foundations for the manufacture of cyanide of potassium. With prussiate of potash for its base, dried animal matter of any and all kinds was dumped into the superheated vessels containing the potash, together with iron filings and borings. A stone-like, black mass resulted from the cooling; and other processes brought the final lemon-colored crystals which resulted from evaporations of the solutions. From these crystals prussic acid was evolved. A chemist, putting a cyanide solution in a gold-lined dish in 1844, discovered that the gold was dissolved in the liquid. This was the beginning of the gold-plating process by the use of cyanide; and the further involvement of the poison came about in treating refractory gold ores.—*Technical World.*

Driving the First Joint.

How the Ontario Mine Was Found.

Written for the Mining and Scientific Press by Walter P. Jenney.

In the summer of 1882 I was traveling through Sonora, with Mr. George Hearst, when he told me how, ten years before, he found the Ontario mine. A prospector from Parley's Park, Utah, had brought into Salt Lake City samples of quartz mixed with canary-yellow and bright blue oxidized ore (the characteristic surface-ore of the Park City district resulting from the oxidation of mixed galena and arsenical gray copper), that assayed 100 to 300 oz. silver per ton. The vein, the prospector stated, outcropped 50 ft. wide for hundreds of feet along the mountain-side. Mr. Hearst said: "When I got there, I found an immense reef of quartzite, with occasional scattered nests of ore, and saw at once that it was no good. That reef is there today in McHenry gulch, and has never been worked, save in a small way. While I was looking over the ground, a miner told me that about two miles west, just over the divide, some boys had struck a vein of the same kind of ore, and he thought they had a good show to make a mine. I went to see it; they had two openings on the vein less than 100 ft. apart, and a shaft down about 50 ft. The ore in the widest place measured not more than 18 in., but the vein had all the marks of a thoroughbred; and I decided to buy it, if the ore assayed as well as it promised. When I got back to Salt Lake, my samples assayed 60 to 125 oz. silver per ton, with an average of about 80 ounces. Shortly after this, I purchased the mine for myself and Mr. J. B. Haggin of San Francisco, for $32,500, and Mr. R. C. Chambers was appointed superintendent. The Marsac mill, built for the Flagstaff mine, was leased, and we at once started to open up the property."

In its early history the Ontario never had an assessment; the mine paid for everything, repaid its purchase price and met, from the output, the expense of machinery and development. The gross production to date is nearly $36,000,000 and there has been disbursed in dividends $15,000,000.

The Value of the Orient.—Without transportation there can be no commerce. As civilization has advanced, commerce developed, transportation cheapened, and the wants of man expanded, the importance of the commercial prize of the Orient has increased until its value has today reached the enormous sum of nearly 3,000 millions of dollars per annum. In 1805, the world had not a single steamer upon the ocean, a single mile of railway on land, a single span of telegraph upon the continents, or a foot of cable beneath the ocean. In 1905 it had over 18,000 steam vessels, 500,000 miles of railway, and more than 1,000,000 miles of land telegraph, while the very continents are bound together and given instantaneous communication by more than 200,000 miles of ocean cables, and the number of telephone messages sent aggregate 6,000 millions annually, and one-half of them in the United States alone. The effect of this enormous increase in the power of production, transportation, and communication has been to multiply commerce in all parts of the world. The world's international commerce, which a single century ago was less than two billions of dollars, is now 22 billions, and the commerce of the Orient, which was less than 200 million dollars, is now nearly 3,000 millions.—O. P. Austin, Bureau of Statistics.

Life at Johannesburg.

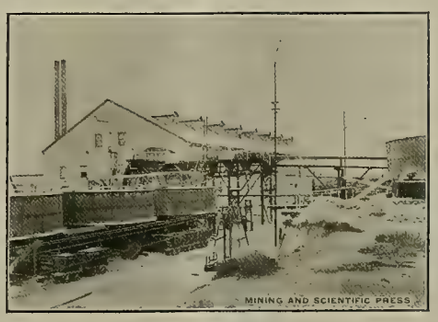
In the *Daily News*, one of the leading newspapers of London, H. W. Massingham describes the golden city of South Africa in a manner calculated to interest our readers. He says:

Johannesburg is an infant phenomenon in cities, a mere babe of eighteen years' growth. It, too, has its shabbily splendid air. Skyscrapers are joined onto common things in corrugated iron; commercial palaces descend into unpaved or ill-paved pathways. The fine shops in Pritchard street are as lavishly equipped with modern finery as those of Oxford Circus, and here and there exhibit lines of genuine beauty. But symmetry in height and plan is completely wanting; the streets, like the mine owners, are a law to themselves. Farther out live the dependents, Asiatic or European, Indian hawkers and traders, Portuguese market gardeners, Malay or Jewish cabmen, while more distant locations are being built for the Kaffirs. The talk and tone of the city are thoroughly cosmopolitan. Inscriptions in Yiddish or Chinese are to be seen in the windows of many of the smaller shops on the outskirts.

The city has many of the characteristics of the mining camp. The Rand is largely a community of bachelors, living well but cheerlessly in boarding houses. Men are as three to five of the residents, and if you take the population over 16, two to one are males. The Postmaster-General assured me that not 5% of his clerks were married men. The women are pretty, rather delicate, in air. They dress with refinement, and many have the spoiled, petted expression of carefully tended and much-admired beings. The night side of such a society exists, but is more decently veiled than that of London. There is a strenuous and public-spirited municipality, which proudly owns a debt of five and a half millions, plus its share of the extravagant price—three and a half millions—paid for the water supply. But the debt is partly remunerative, and a large scheme of re-housing promises well. The spirit of the Council seemed to me enlightened and progressive, and the water board stood up manfully and hotly to Lord Milner when he intervened to secure Messrs. Eckstein the inflated price they claimed for their water properties.

Living is abominably dear. Food prices are tolerable, with the exception of some luxuries, like champagne, which costs from 25s. to 30s. a bottle. But rent in itself is almost prohibitive of living on the European scale of salaries and wages, and greatly hinders marriage. Within the town £8 a month have to be given for lodging barely sufficient to house an artisan family of five, and Mr. Aiken assigns the living cost of such a family at nearly £300 a year. For the professional man rent is also out of all proportion even to our London experience. A house which would rank as a comfortable but smallish villa for Clapham or Putney will cost £100 a month on the outskirts of Johannesburg. In Parktown, the 'fashionable' suburb, not a dwelling can be rented for less than £50 or £60 per month. High wages, a high rate of interest—8%—on mortgages, and the cost of building material are large items in these charges, swollen by the vicious system of using railway rates as a main source of revenue. Wages and salaries partially rise to meet this expenditure. The skilled miner may make £40, £50, even £90 or £100 per month on his monthly contract. Skilled workmen earn from £1 to 25s. or 30s. per day. In a printing office a linotype operator gets £7 a week, and the working week is not long, ranging from 45 to 48 hours. Among the professional ranks, a sub-editor makes from £400 to £500 per year, and the highest editorial salary I know of is £3,000.

One of the first discoveries that a stranger makes in Johannesburg is that no one—not even the cabman or the policeman—knows his way about it. The dwellers in this city-center of 60 miles of gold-bearing reef rarely look on it as their home. 'Cousin Jack,' the Cornish mining contractor, and the millionaire owner of the soil and what lies below it, alike turn their eyes to Europe. Most of the heads of the great houses are absent, though the peril of a political reverse is driving them back. Thrift does not prevail in unsettled societies. Money in Johannesburg goes as lightly as it comes, and wages and profits are easily diverted to the Kaffir market, for all classes join the gamble in its shares and speak its jargon. The tone is secular; the earth-spirit demands a man's all, and usually gets it. Most of the constituents of the strangely mixed community—black, white and yellow—are pleasure loving, and Sunday is a day of amusement, with cricket and tennis in full swing, and gaily dressed parties everywhere. Straw and felt hats and light jackets are the only wear for men Sundays and weekdays; our tall hat and frock coat are taboo in South Africa, and I believe the High Commissioner is willing to banish them from his garden parties. Club life is indispensable to such a community, and all parties meet in it on outwardly friendly terms. The spacious hall of the Rand Club, on the first floor, set in a pleasant decoration of green and gold, forms the social and political exchange of the day. There magnates, mining magnates, engineers, prospectors, Government officials, lawyers, Boer generals, "Progressives," "Responsibles," journalists and nondescripts meet in crowds for coffee and talk after the luncheon hour. A quieter retreat is the Athenæum, where the mining element is somewhat less dominant. But practically all Johannesburg society is made by the heads of the great financial groups and their more trusted dependents—many of them American—whose salaries of £5,000 a year or so enable them to run the race by the side of their chiefs. There lies the danger for the Government; their servants are far too near the mining 'super-man' to maintain full independence of policy and demeanor. Gossip naturally has a cynical edge; none is spared by it. Men's pasts are too recent—and too interesting.



City & Suburban Mill.

The Rand

The mining over-lords of Johannesburg have done little to dignify it with public buildings or memorials of their wealth and power. The municipal offices are a mean labyrinth of wooden shanties, and public spirit is timid and depressed in a community where, after a brief revival, a free daily press has ceased to exist. To the pessimism that weighs down an Englishman's active, practical spirit when he surveys the seeming caprice of Nature as she deals with man and his works in the South African desert, are added the want of free institutions and the fear of the great houses, with their hand on the springs of every man's material life. They use their influence hardly. Rebels like Mr. Wybergh, Mr. Cresswell and Mr. Pim, in their way the salt of English society on the Rand, become exiles as soon as they lift a finger against the decreed policy. "I lost 40% of my trade when I opposed the coming of Chinese," said a leading figure in Johannesburg.

A certain newness and rawness run through the life of Johannesburg; it is a hastily scrawled chapter of South African history. The streets are more tumultuous than our own, and gay even in these depressed times. The subjection of the Kaffirs is marked. In Cape Town the mixed colored population disputes the pavement with the white man, and shows him no outward deference; in Bloemfontein it is submissive, but is not excluded from the sidewalks; in Johannesburg the native keeps humbly to the roadway, and is never seen abroad in the evening hours. The mixture of races, the gaudy coloring in the shawls and headdresses of the native women, the louping run of the bedizened Kaffir 'rickshaw bearers, the rattling of the mule teams and trolleys used in the service of the mines, and the exuberance of their black drivers, all the hurry and disordered fret of a community working at high pressure for the bread that perishes, make up a picturesque jumble such as our more settled and homogeneous city life does not know. Poverty, indeed, as we have it—poverty in rags and grime—is unfamiliar. There are distressful cases, and things are incomparably worse than before the war, but there is something like an equilibrium between demand and supply in white skilled labor. The capitalist has no 'overspill' to play with, and wages are almost constant at their present high figures. All white men dress well; slovenliness in appearance is usually due to drink or luckless gambling in shares. I have heard of £2,000 or even £3,000 accumulated by miners and lost in this fashion. The range of achievement in art is naturally poor; no form of dramatic amusement seems to be seriously cultivated, and the music-hall in particular, though respectable enough, hardly touches a fair provincial level.

TIMISKAMING COBALT MINES.—The ores are in veins, usually nearly vertical, in the Lower Huronian sediments, in the Keweenawan gabbro, and to a less extent in the Keewatin green schists. These veins vary in width from a fraction of an inch to a foot or more. While for the most part their walls are well defined and their direction constant, they frequently divide and bend. They follow with local variations systems of joints which cut the region somewhat uniformly in north to northwest and east to northeast direction. An inspection of the map of Ontario shows many of the drainage lines following approximately these directions, though it is not known that they are all controlled by joints or faults. The depth of the veins has, for the most part, not been determined, but it is known that they are most even and persistent in the Huronian sediments and the Keweenawan gabbro, and that in reaching the Keewatin below they become less uniform and persistent, a fact to which may be attributed the less common occurrence of rich veins in the Keewatin than in the overlying formations. The depth is thus practically measured by the thickness of the Lower Huronian, given as 500 ft. as a maximum, but usually less.—Willet G. Miller, *Ontario Bureau of Mines.*

APPLIED GEOLOGY.—Nothing appeals so strongly to the practical man as a specific case to illustrate a given proposition. The value of concrete instances in illustrating the application of geology to engineering problems can hardly be over-estimated. The student may forget an abstract geological principle before he has left the lecture-room; but he will remember an actual case, illustrating the application of that principle, for years. It seems to me that a most important part of the work in teaching applied geology is the securing of details regarding actual cases in which geology has been used to such advantage by practical men. Many such cases can be found by looking over the literature, but another source of wealth is to be found in the cases which come to the knowledge of geologists and engineers, but which have never found their way into print. One cannot help wishing that these edifying experiences might be made available for the benefit of the younger and less experienced men, by publication of the valuable technical details, stripped of the personal features which might otherwise make the publicity distasteful to some of those concerned. Many are the valuable object lessons that would thus be presented to the younger engineers and geologists.—Douglas Wilson Johnson, in *Economic Geology.*

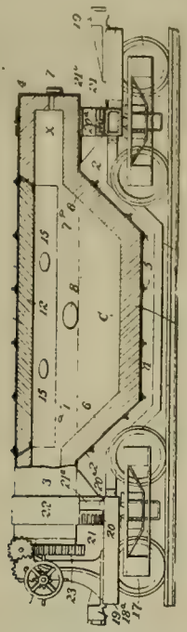
THERE are 58 tube-mills at work in, or ordered for, the Transvaal.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 23, 1906.

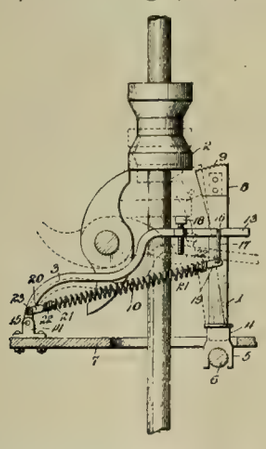
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR STORING AND CONVEYING LIQUID METALS.—No. 810,301; C. Von Philp, Bethlehem, Pennsylvania.



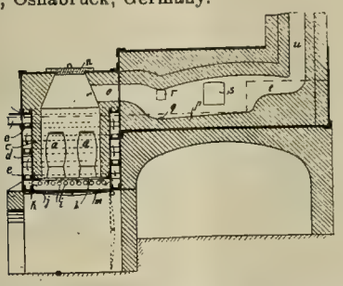
An apparatus for storing and transporting molten metal consisting of a vessel and suitable trucks supporting the same, the vessel having an enlarged body portion and hollow contracted cylindrical ends containing burning-chambers and means for admitting fuel thereto; ends turning in bearings on the trucks.

AUTOMATIC SAFETY ATTACHMENT FOR STAMP MILLS.—No. 810,006; J. C. H. Vaught, Lead, South Dakota



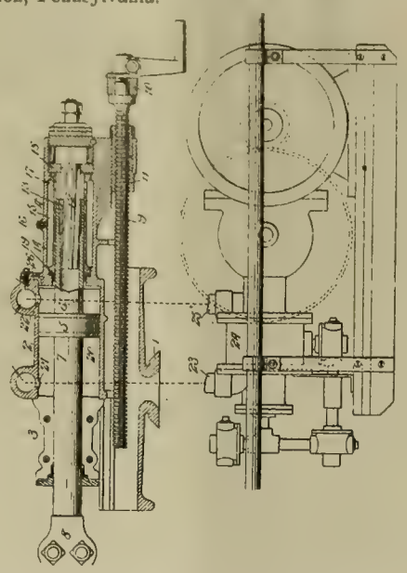
The combination with a tappet, and a cam for actuating, of a safety attachment for stamp-mills, comprising a tappet-support normally arranged beyond the path of the tappet, and means located beneath the cam-actuated tappet and arranged to be directly operated by the tappet for moving the support into the path of the tappet, whereby the latter will be supported out of operation.

DUPLEX SMELTING FURNACE.—No. 810,063; R. Lindemann, Osnabruck, Germany.



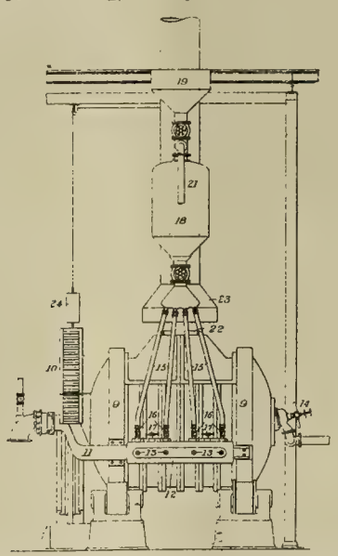
In a duplex smelting furnace, a primary hearth capable of being intensely heated, an inner refractory wall around hearth, an outer metal casing surrounding inner wall, air passages in outer casing, an air inlet communicating with air passages and with a source of air under pressure, a baffle-plate for directing the admission of air in opposite directions from the air passages round the furnace to the hearth, air holes at the base of the primary hearth for admitting the air under pressure, a movable plate adapted to shut off hermetically the ash pit from the primary hearth, and a secondary hearth alongside the primary hearth and capable of being heated by the waste heat from the primary hearth.

ROCK DRILL.—No. 810,639; Arthur H. Gibson, Easton, Pennsylvania.



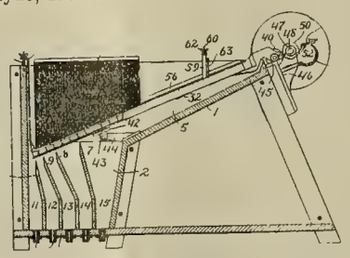
The combination with a rock-drill cylinder having a rear extension, of a piston having a hollow tail-rod extended into and entirely inclosed by said rear extension, a sleeve surrounding the tail-rod forming an annular chamber within the rear extension, a rifle-bar telescoping within the tail-rod, a port leading from the annular chamber to the air space within the sleeve and tail-rod and an aperture leading from the annular chamber to the exterior.

METHOD OF REFINING COPPER.—No. 810,249; R. Baggaley, Pittsburg, Pennsylvania.



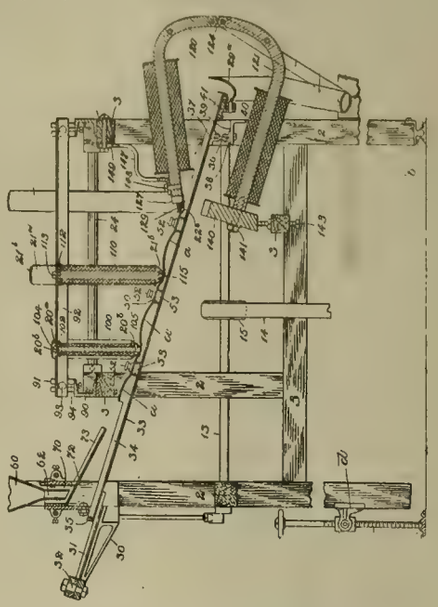
The method of refining copper, which consists in injecting sawdust into a bath of molten copper in a bessemer converter before oxidation is completed and utilizing air under pressure as the propelling medium.

ORE CONCENTRATOR.—No. 810,847; Emil Deister, Fort Wayne, Indiana.



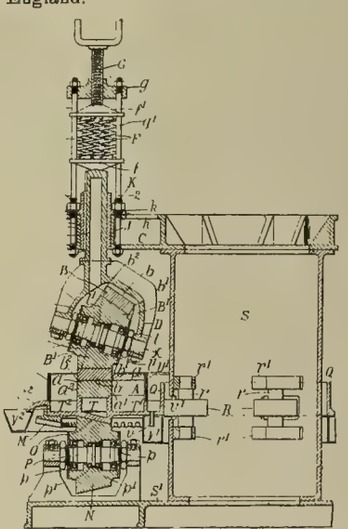
An ore concentrator comprising a stationary tank adapted to hold a body of water; and a concentrating pan having upturned sides at its upper portion and convergent edges at its discharge end, and having also riffles upon its concentrating surface which converge toward its discharge end, the said pan being arranged in the tank with its concentrating surface beneath the level of water contained therein, and being adapted to be reciprocated in line with the plane of its concentrating surface.

MAGNETIC SEPARATOR.—No. 810,841; Henry F. Campbell, Melrose, Massachusetts.



The combination in a magnetic separator, of a magnet; a tray, presenting an unobstructed surface at a due distance below the magnet, for supporting and conveying the material spread in a film of substantially uniform thickness under and past the magnet, and through an uninterrupted field of such magnet, a cover for said tray for preventing the passage of magnetic particles to the sides of the magnet, and means for imparting a transverse shaking movement to the said support.

PAN-AND-ROLLER MILL FOR CRUSHING AND GRINDING.—No. 810,830; Johannes C. Wegerif, Battlesbridge, England.



In a pan-and-roller mill, the combination with a pan provided with a horizontal grinding-face upstanding from the bottom of the pan and having its inner and outer faces vertical, of a grinding-roll of truncated conical form disposed with its smaller end toward the interior of the pan, the axis of the roll being set skewwise in the pan and at such an inclination as to enable parallelism to be maintained between the grinding-faces of the pan and roll at their line of bite, the relative widths of said faces being adapted to prevent the formation of a groove or step on either of them, and the marginal portions of the inner and outer ends of the roll being respectively concave and convex so as to be normal to the grinding-face; a dead-axle whereon the roll is mounted to rotate; a yoke-frame straddling the roll and carrying the ends of said axle; a vertical ram integral with said yoke-frame and having its axis alined to intersect the line of bite of the pan and roll at the center of said line; and a bearing in the frame of the mill adapted to permit of said ram moving vertically without turning.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

LONDON, January 24.

The output of gold from West Africa in 1905, £632,757, compared with £345,608 in 1904 and £254,790 in 1903, shows an appreciable progress. The result is, however, far from satisfactory, as against the amount of capital which was embarked in Gold Coast mining, mainly during the lull in gold mining in the southern part of the African continent consequent upon the Boer war.

One of the striking disappointments of West Africa is the Gold Fields of Eastern Akim Company, which held a meeting of its shareholders last week to consider a scheme of reconstruction. The origin of this company may be traced to the Castle Gold Exploration Syndicate, which, starting with a nominal capital of £50,000, purchased for £700 in cash and £3,000 in shares properties covering 500 square miles of territory. From this operation was evolved an example, as the *Economist* describes it, of the marvellous methods of mining enterprise in West Africa. Before the Castle Gold Exploration Syndicate was wound up in 1903, the goldfields of Eastern Akim arose under its auspices. Of the available cash capital of this offspring, amounting to £98,805, the developments on the property, including a road 52 miles long through a part of the Colony previously almost unknown, absorbed £97,870. Thus the company, like many others ranging over an unwieldy area, exhausted its financial resources before obtaining any sure indication of the potentialities of the property it was intended to explore. In all, nine companies were formed as the outcome of the Castle Gold Exploration Syndicate, their capitals aggregating a total of £1,060,000, composed largely, it must be said, of paper. Most of these subsidiary companies, it is stated, were prevented by a variety of causes from doing more than prove that their concessions were valuable. The measure of success achieved by this group of bantlings may be gauged by their market prices of today—for the best of them bring only a shilling or two per share.

A more cheerful theme for comment is to be found in the proceedings at the annual general meeting of the Associated Northern Blocks (Western Australia) held last week. The workings during the financial year ending September 30, 1905, were limited to the development of the old Brownhill lode across the property, going into the Oroya. At the western end a new orebody was opened out, extending up to the Kalgurli. Satisfaction was expressed in the reduction of costs during the year. The cost of development per foot was £2 15s. 7d., against £3 14s. the previous year; diamond drilling was 10s. 7d. per foot, instead of £1 in 1904. The working expenses amounted to 26s. 2d., namely, ore extraction, 8s. 1¾d.; milling, 13s. 4½d.; general, 4s. 7¾d. Forty thousand one hundred and forty-six short tons of ore were treated, with a recovery of 89.6%, and 3,095 tons of slime were re-treated, yielding a total of 46,605 oz. bullion, which realized £183,095 7s. 7d. Debiting the whole of the mine development and the working expenses, and writing off liberal allowances for depreciations on capital expenditure, and charging all administrative outlay, a net profit was shown of £71,889 0s. 2d. After paying dividends amounting to 25% for the year, the funds in hand were £132,000. The company has observed the sound policy of largely writing off the capital expenditure to revenue account, prompted to this course probably by the anticipation some little time back of soon exhausting the mine. Although the grade of the ore has seriously fallen off, the reserves have, contrary to expectation, again assumed very satisfactory proportions. At the end of the year they amounted to 89,399½ tons (of 2,000 lb.) and were valued at 100,000 oz., or an average of 22.37 dwt. per ton. Thus the company's assets, represented by its funds in hand and net ore reserves, were, at the end of the financial year, at a ratio of about parity with its nominal capital of £350,000. In addition, the company held a three-fourths interest in the Great Leviathan Lease, at Yilgarn, described as still in the prospecting stage, but of a promising nature.

A canny Scot, writing to a financial paper lately in a disillusioned vein concerning his speculations in certain South African mines, was moved to warn his brother shareholders against a too great reliance on mining valuations. Even where big developments and ore reserves are the order of the day, prophetic utterances on prospective values must not, like the Delphic oracle, be deemed infallible. Much more is this to be borne in mind in dealing with mineral properties in the early stage of exploration. Two cases of this kind came under notice at company meetings last week, the mines being whole continents apart. The chairman of Dolores Limited (Mexico), in dilating on the unexplored resources of the mine, pointed out that the original owners did not suspect the existence of the Alma vein, upon which some £300,000 worth or more of ore is now opened up, when they started the main tunnel crosscut. They intended the crosscut for the exploration of a vein which they had worked from the surface, but on reaching a point 150 ft. short of the vertical line of that vein, the crosscut intersected another vein—the Alma—which was found to be so rich and powerful that they left the original vein, for which the mine was originally purchased, entirely alone. The other instance was mentioned at the meeting of Sansu Mine Ltd. (West Africa). The consulting engineer, Arthur C. Hodge, stated that with regard to the developments, he had recommended work at the southern portion of the mine, near the granite contact; they had not, however, touched that granite contact at all, because in sinking the shafts and crosscutting 44 ft. they cut the lode where it was surprisingly rich; they had not expected to get anything of value in that, the northern, part of the mine.

Another new development is reported in the Eastern Rand area (South Africa). At the Cinderella Deep, in the neighborhood of Boksburg, the drill in a borehole from bottom of the shaft—3,900 ft.—entered the Main Reef series at 4,000 ft.; the reef is stated to be 9½ ft. wide. The opinion is held that the greater depth of reef shows that both the outcrop and deep-level mines in the vicinity contain much more reef, giving a longer life than was anticipated.

A recent cable stated that assays made of the 6-ft. upper band in the borehole show an average value of 20½ dwt. over one continuous width of 6 ft. The richest portion lies in the foot-wall section of this upper band, of which nearly 15 in. gives a mean assay-value of 92¾ dwt. The appearance of the reef is reported to be similar to that in the Cason mine, to the north.

ALASKA.

The Kirkman Creek concession has been canceled and was thrown open on Jan. 31. The concession extends from the upper line of the Discovery claim down the stream for five miles. It was granted to Peter R. Ritchie and G. F. Washburn in 1901.

It was in the fall of 1904 that the productive claims on Little creek, in the Nome district, first came into prominence. Since then they have yielded nearly $1,500,000. Much the greater part of the gold taken out came from four claims located within an area little greater than one-tenth of a square mile. Little creek is a tributary of Snake river, at the mouth of which is Nome. The bonanza claims of 1904–5 are near the tracks of the Nome Arctic Railroad, three miles north of Nome. The gold deposits lie deep. Shafts have been sunk as far as 50 ft., but the average workings are between 30 and 35 ft. below the surface. Frozen muck and moss, varying in thickness from 12 to 23 ft., form a heavy covering for the gold-bearing gravels. Some of the gravels are apparently well-washed beach sands; others were without doubt deposited by streams. Beds containing boulders, some of which weigh a ton, frequently top the workable gravels and are a constant source of danger in mining, especially during summer months, when the roof is weakened by thawing. These boulders occur sometimes on bedrock and are sometimes found in the muck that overlies the gravels. Nearly all the deposits, from surface to bedrock, carry gold, but the rich gravels are found well down. In some places they rest directly on the schist; in other places they rise to the height of five or six feet above it. The gold-bearing gravels of present economic importance have a thickness of between four and five feet, which increased to 16 ft. in one instance where the material removed formed a lenticular mass. Thin, elongated lenses or beds of reddish sand, called ruby sand, the color of which is due at times to small grains of red garnet and at times to iron oxide, occur throughout the pay gravel and often contain so much gold that it can easily be detected, even in careless handling. Mica-schist, in which there are occasional thin limestone beds, forms the true bedrock, but the so-called 'bedrock' on which the gold lies is sometimes the schist, sometimes a clay streak, and in one place it is gravel cemented with calcite deposited by circulating waters. Part of the gold is fine, bright, and flaky, but part of it is coarser and contains many nuggets worth five and ten cents apiece and occasional ones worth several dollars. One important result of the Little Creek discoveries is that they have led to more active prospecting in the tundra gravels. It has been known for some time that a small amount of gold is almost always present there but the occurrence and position of any other beach line back of Nome can be determined only by actual investigation. It is safe to predict that the Nome tundra will be the scene of more extensive operations during the present winter than in any previous year.

In the Tanana district, at the upper end of Fairbanks creek, L. T. Holte is working No. 8 above, recently purchased from Shay & Hannon for $102,000. He is operating a 50-h. p. steam hoist. The upper half of No. 7 above is owned by Larsen & Meehan, who are hoisting pay dirt on to the dump. The lower half of No. 7 is owned by L. T. Holte, who is operating through his manager, Theo. Oleson. No. 6 above is not being extensively worked. The same may be said of No. 5 above. Dilman & Winters are working the upper end of No. 4 above. Several shafts have been sunk and considerable tunnel work done. The owners have been timbering their tunnels and will be ready for work in the spring. The middle portion of No. 4 is being worked by Belt & Hendricks. The lower end of No. 4 is being worked by Homer & Oscar. James Kelly is operating the upper half of No. 3 above and has a large amount of good pay dirt on the dump. The lower half of No. 3 is owned by D. B. Olson, who probably has more work done at the present time than any claim on the creek. Adolph Rippa has a lay on the upper half of No. 2 above and expects to do a large amount of summer work next year. The lower half of No. 2 is also being worked by laymen, and will also be made ready for summer work. No. 1 above is owned by Dan McCarty, but is being worked by Gus Bostron, who has the lay on this property.——Discovery claim is being worked by Shepherd Bros. They began operations last fall, and it has taken until this time to get the property ready for work. No. 1 below is being worked by Freeman & McLeod, on the upper half and by Julian & Spencer on the lower half. Rudolph Alm is interested in the upper part of No. 2 below. The lower half is being worked by Mr. McMahon. No work is being done at present on No. 3 below. Windlass work is being done on No. 4 below, but at present nothing definite is known as to what pay this claim will produce. No. 6 below is owned by James McNamee, and six sets of laymen are working on this claim. Nothing definite is known of No. 7 below. Billy James is preparing to do extensive work on No. 8 below. He has let several lays on this ground, and, as said, will work a portion of the ground himself. No. 9, 10 and 11 are owned by Mr. Solon and partners. No work has been done before on any of this ground, but the owners are preparing to prospect it. The Fairbanks *Times* says that Fairbanks creek has a bright future, and when compared to others in the district makes a good showing.

ARIZONA.

Cochise County.

R. V. Daniels, of the American Mining & Developing Co., states that his company has completed a 3,500-ft. tramway at its mine in the San Jose mountains, near Naco, and that he plans to start the company's mill on February 15.——The Tombstone Consolidated Mining Co., of Tombstone, has ordered an additional pump which will be placed on a 700-ft. level and used to furnish water to the pump on the 600-ft. level. The company's stamp-mill will begin operations about February 15.——Superintendent Fisher, of the Cochise Gold & Silver Co., let a contract for driving tunnel at the company's mine near Tombstone 100 ft. farther. The tunnel is now in 570 feet.

Gila County.

The Montezuma Copper Mining Co. have started development work on their property near Globe and at the depth of 18 ft. have struck sulphide ore. The company intends to continue sinking a perpendicular shaft until water level is reached before crosscutting the ledge. The shaft is 5x7, but will be timbered with 6x6 and 2x12 lagging, which will give them a compartment and a half 4x4 and 2x4 in the clear.

Graham County.

Among the companies mining for gold near Clifton are the Sierra de Oro, managed by Dell M. Potter; the Crawford Gold Mining Co., under the management of Ben M. Crawford; the Arizona Gold Mining Co., Wood Poland manager; and the Gold Belt Development & Reduction Co., under the management of E. U. Beauchamp.——The Shannon Copper Co. during 1905 received more than 500 oz. of gold and 17,000 oz. of silver from their copper ores.

Mohave County.

E. Riverol, of Los Angeles, has selected a site for a smelter at the Pinkham mine, near Chloride. He has a plant in operation at Los Angeles for experimental purposes, and is arranging to remove it to the mine.

Pinal County.

The main shaft of the Superior mine, near Florence, is down 750 ft. and is to be continued to the 1,000-ft. level. Water is coming in freely, but so far is kept down by pumping.——The mill at the Desert Queen mine, near Casa Grande, is to be doubled in capacity and a slime plant is to be put in.

Yavapai County.

The Red Man Mining & Milling Co. is working claims near McCabe. The main shaft is down 200 ft. A hoist and air compressor are to be put in.——The Metallic King Mining Co. is working claims in Lower Lynx creek, three miles from Dewey. A hoist has been placed on one shaft, which will be sunk 200 ft. The ore is free-milling above water level.——The Mark Twain and 86 mines, near Prescott, have been taken over by the St. Anthony Mining & Milling Co. A boiler, hoist and pump are to be placed on the property.

President J. M. Sullivan, of the Great Republic Mining & Milling Co., states that the shaft on the company's mine near Prescott will be continued from the present 725-ft. level to the 1,000-ft. level, and that another shaft, now down 200 ft., will be continued.

CALIFORNIA.

Humboldt County.

H. G. Van Vactor, president and general manager of the Klamath River Dredging, Mining & Developing Co., has purchased a drilling plant, which will be put on the Klamath river holdings of the company. The company has removed its headquarters from Dunsmuir to Eureka.——Bert Lucas, president of the Humboldt War Eagle Mining & Milling Co., is in San Francisco, arranging for the purchase of a stamp-mill to be put on the company's property, between Redwood and Willow Creek, near Eureka.

Inyo County.

The Great Western Ore Co., of Keeler, has notified mining companies that the company's smelter will be ready to receive ore on March 1.

Mono County.

J. M. Bryan, one of the owners of the Pittsburg mine, at Masonic, says that the camp is mostly in the hands of leasers, many of whom are taking out shipping ore. There are two blocks leased on the Pittsburg, one to Whiffley & Eastwood, who have shipped over $5,000 worth of ore to the Reno Reduction Works, and the other to Smith & Shaffield, who are also taking out considerable ore, which they are holding, as they will put up a mill on the ground in the spring. These leases do not expire until November.

Nevada County.

Worthington & Patrick have been awarded a contract to run the tunnel at the Zeibright mine, near Emigrant Gap, 50 ft. farther.——George Downey and J. Manion have been awarded a contract to sink the shaft at the Banner mine, near Grass Valley, 200 ft. deeper. The owners of the mine furnish power, air and supplies.——The hoisting works of the Nevada City mine was slightly damaged by fire last week.

Operations have been resumed at the Federal Loan mine in Willow valley, near Nevada City. Superintendent F. L. Whipple is in charge.

Placer County.

Work is to be resumed at the Hathaway–Eureka mines, near Ophir, after new machinery has been put in.——C. A. Reed is repairing the St. Patrick mill, near Ophir.——The Southern Cross on Duncan hill, near Ophir, is being worked by A. L. Martin.——Development work at the Kittler mine, near Ophir, is to be increased.——The Cornucopia mine, near Ophir, has been re-timbered by G. Savalle.

San Bernardino County.

Frank Cram and J. H. Pattee have purchased a 25-ton mill to be installed on the Brooklyn Mining Co.'s property at Highland.

Shasta County.

The Mountain Copper Co. has let a contract to J. W. Shelby to drive a 1,000-ft. tunnel at the Lone Star mine, west of Iron Mountain.

Sierra County.

(Special Correspondence). — The Tightner at Alleghany is going to put in a power plant and has already put in a compressor to run the drills. —— The South Fork at Forest City is working 20 men taking out good pay gravel. —— The crew of the Alleghany company's mine at Balsam Flat is being increased. —— The Sierra Buttes had to hang up the lower mill for a few days on account of repairs to the tramway, but are running to full capacity again with a crew of 120 men. —— The Cleveland mill at Alleghany has been started. —— The Empire mill, near Downieville, had to hang up the stamps on account of the electric plant burning out.—— Development work has been continued throughout the winter at the Sovereign. —— George W. Coover and George B. Morse have located a copper claim on the South Fork, between Sierra City and Downieville.—— Good ore has been struck in the upraise of the Last Resort mine.

Downieville, Feb. 5.

Work is to be resumed at the Deep Blue gravel mine at Alleghany by J. M. Walling. The main tunnel is to be repaired and driven ahead to prospect the channel.

Siskiyou County.

J. Freshour of Gottville will build a new ferryboat to replace the one which was lost in the recent flood. Gottville is 18 miles from Yreka on the other side of the Klamath river, and the ferry was the only means of crossing the river. The loss of the ferry forced the Lucky Bob mine, operated by C. W. Zimmer, E. S. Dingman and S. M. McFerran, and the Empire mine, owned by Carter & Taylor, to close down.——E. W. Raymond, superintendent of the Ball mines, near Sawyers Bar, is getting the property in shape for mining in the spring. Crosscut tunnels are being run now to connect the Stephens and Ball groups. ——The Medina Mining Co., of Oro Fino, that was compelled to close down the Old Johnson mine, on account of the ditch water freezing, has resumed work again. Their mill is crushing ore from the Gardner mine.

Trinity County.

The Bullychoop Gold Mining Co., operating on Bullychoop mountain, near Weaverville, will replace its present 10-stamp mill with a 50-stamp mill, to be operated by electric power. A third tunnel is being run at the mine, which will extend 1,500 ft. and tap the vein 600 ft. below the surface.

The electric dynamo at the Enterprise Mining Co.'s property on East Fork, near Weaverville, was started up a few days ago and the entire property is now being operated by electricity.——Schlomer Bros. began the operation of their placer mine at North Fork last week. Corbig & Lasche, of Los Angeles, have completed a plant for saving fine gold at the end of Schlomer Brothers' flume.

Tuolumne County.

A Los Angeles company has secured the Swerer, at Tuttletown, and work has been commenced under the superintendency of J. L. Witney.——Ten machine drills are at work on the 200, 300 and 350-ft. levels of the Draper. The mill's full complement of stamps is dropping. The water in the main shaft has been lowered to the 400-ft. mark. —— Work is to be resumed at the Republican mine, at Jacksonville, as soon as the flume is repaired.

COLORADO.

(Special Correspondence).—On account of complaints being made by investors against some of the promoters of mining stock in Denver, it is understood the United States Government is making a thorough investigation of several of the promoters and brokers and their methods of doing business. An exorbitant commission for financing a mining property is the complaint made by some of the investors and which has probably been the means of inducing the Government to take a hand in the affairs of the brokers. Many of the brokers are doing a strictly legitimate business, while others are not giving their clients any more then the law requires. In some cases it is claimed the postage bill and office penses are higher than the expenses of operating the property. A closing up of the unreliable promoters will be welcome by the ones who are doing a legitimate business.——The coal companies in the State are looking forward to the big strike on the Eastern mines as they believe there will be no strike among the coal miners of this State and that the demand for Colorado coal will be much greater than ever before. In anticipation of the above results, it is understood a large number of mines that have been idle for a number of years are preparing to produce coal.——The railroad connecting with the Colorado & Southern at Silver Plume, in Clear Creek county, and extending to the Wilcox tunnel and other properties in the East Argentine district has been completed.

Denver, Jan. 5.

Boulder County.

The Gold Run Mining & Tunnel Co. has consolidated the Tambourine group with the Tenderfoot, Daisy, Independence, Cedar Falls, Handy and other lode claims between Salina and Wall Street. They will extend the present Tambourine tunnel to connect with one driven from the north side of the mountain.

Chaffee County.

The Colorado Comstock Mining Co. plans to drive a 2,000-ft. tunnel into Pomeroy mountain, in the Chalk Creek district, near Hancock. Machine drills are to be used.

Clear Creek County.

(Special Correspondence).—Deep development by crosscut tunneling is being prosecuted in Clear Creek county. In the early '70s the mines were producing fortunes for their owners, even under the wasteful methods of those days; mines which since have, from various causes, been worked at a meagre profit, at a loss or not at all. In many instances veins lost their contin ity, values disappeared at shallow depth, and the conviction prevailed that 'ore values did not go down.' Clear Creek county is now making a good showing with her deep crosscuts. That of the Two Brothers tunnel, of the Specie Payment Gold Mining Co., was started two years ago from Virginia canyon, 2,600 ft. distant from the Specie Payment vein, and reached it January 7, 1906, cutting it at 1,400 ft. in depth.

Georgetown, Feb. 3.

The Crown Point claims, on Columbia mountain, near Empire, have been transferred to the Bellevue-Hudson Mining Co., who will continue the crosscut drainage tunnel.

A rich strike has been made on the Peters lode, near Georgetown, owned and operated by the Pay Rock Mining Co. In driving east from the Ashby tunnel level a body of solid smelting material has been uncovered. The Pay Rock group is being developed under the management of E. F. Kendall.

Gilpin County.

The shaft of the After Supper mine at Black Hawk is to be sunk 300 ft. deeper to a depth of 750 ft. A. Waters has charge. —— The consolidated properties known as the Gregory-Bobtail, Fisk, Cook, Mammoth and others in the Gregory district, which have been operated under the Gregory & Bobtail Mining Co., are to be operated as the Fifty Gold Mines Corporation, with O. B. Thompson as manager.——The Boston & Colorado Smelting Co. at Argo will pay an advance of 25c. per unit for the copper contents in ores over previous schedules.

Superintendent S. T. Harris, of the Taawasa Gold Mining & Cyaniding Co., operating the Aduddell mine in South Willis gulch, near Central City, is to let a contract for sinking 100 ft. and driving six levels 100 ft. each. The last lift of 100 ft. was sunk with four men in 35 days. The main shaft is down 500 ft., and as soon as levels are started at the bottom sinking will again be resumed, with the intention of continuing the shaft for a depth of 1,000 feet.

Lake County.

The Damascus Mining & Milling Co. is building a custom mill in Leadville, to be equipped with seven magnetic separators. It will also treat ore from the company's property on Mosquito range. It is expected to be completed by March 1.

Pueblo County.

The Philadelphia smelter, owned by the smelter trust in Pueblo, has resumed operations. New machinery, which has been ordered, will arrive immediately and be quickly installed.

San Miguel County.

H. H. Hutton, of Ophir, has taken a lease on the Silver Bell from the Ophir Consolidated Mines Co. He is taking out shipping ore only and holding the milling ore in the mine for treatment as soon as it is possible to start the mill in the spring.

Summit County.

The Abundance Mining & Milling Co., operating extensively on Mineral hill, near Breckenridge, with W. C. Off as managing director and J. G. Goodier, general manager, hope to contract with reliable parties to drill 1,000 or 1,500 ft. on their property on the western slope of Gibson hill, known as Yuba Dam Flats. Otherwise they will purchase the necessary plant and operate it themselves.——The Abundance tunnel, being driven into Mineral hill, has been run 285 ft. of the 1,200 ft. projected.——The Jessie Mines Co., with Jas. T. Hogan as president and general manager, has been organized to operate the Jessie mine and mill near Breckenridge.

Teller County.

The Gold Sovereign mine, on Bull hill, Cripple Creek, has been divided into leasing blocks from the surface to the seventh level. The company will continue to work from the eighth level.

The estimate of the Cripple Creek output for January follows:

	Tons.	Ave.	Value
Smelters	9,980	$60	$ 598 800
U. S. R. & R. Co	25,000	30	750 000
Economic	5,000	32	160,000
Dorcas	3,180	30	94,400
Portland	8,100	28	226,800
Santa Rita	400	6	2,400
Other cyanide mills	1,000	5	5,000
Total	52,660		$1,837,400

General Manager C. B. Burch, of the Little Giant Mining & Milling Co., whose new 150 daily capacity cyanide mill in Pony gulch, three miles from Cripple Creek, was destroyed by fire, has started to clear away the debris preparatory to re-building. The new plant will be completed in May. It will be constructed of iron and the capacity will be increased to 300 tons daily.——The Stewart Leasing Co., which was compelled to suspend operations on account of the destruction of the shaft-house, machinery and gallows frame by fire on the Dexter property on Bull hill, has cleared away the ruins and the construction of the new shaft-house, ore-house and gallows frame is nearly finished.

J. K. Walsh and associates have found a good ore shoot at a depth of 600 ft. in the Forest Queen mine, on Ironclad hill, Cripple Creek.——C. J. Weiter, superintendent for the Ironclad Leasing Co., working the Finn property, on Tenderfoot hill, Cripple Creek, has sunk the shaft to a depth of 250 ft. and will continue it to 400 feet.

IDAHO.

Ada County.

The Celtic Gold Mining Co. is preparing to put in a small cyanide plant on its property in the Black Hornet district, 10 miles from Boise.

Boise County.

Efforts made last week to thaw out the tanks and start up at the Black Pearl mine, near Pearl, proved a failure, and everything has been closed down at the mine for the present.

Elmore County.

The owners of the Hillside mines are preparing to put in a cyanide plant at the Tahoma mine at Atlanta.

Lemhi County.

A new 100-ton stamp-mill has arrived at Red Rock, near Salmon, for the Singiser mine.——The Kitty Burton Mining Co., whose mill near Salmon was burned a short time ago, has resumed operations with 5 stamps and will have 10 more stamps ready soon. —— The machinery for a new 10-stamp mill to be erected by the Rabbit Foot Mining Co., on Silver creek, near Salmon, is on the ground. ——The owners of the Ramey mine at Salmon, who have just completed a 10-stamp mill, are arranging to add 30 more stamps and to equip a complete reduction plant.

Shoshone County.

The new mill at the Golden Reward mine, near Murray, will begin operations on February 15.——Manager C. R. Crysler of the Wake-Up-Jim mine, two miles from Murray, has chosen a site and will put in a 40-stamp mill in the spring.——An additional contract for a 50-ft. extension of the tunnel at the Silver Star mine, at Mullan, has been let by the company. The tunnel is now in 321 ft.——The owners of the You Like mine, near Wallace, have begun drifting on a new orebody. ——Work has been resumed on the Ruth mines, on Ninemile creek, near Wallace. The deep-level crosscut tunnel will be extended.

MONTANA.

Fergus County.

At Kendall the Barnes-King tunnel from the workings near the mill is in 5,000 ft. and has opened up some good ore. The tunnel is to run 2,000 ft. farther.

Jefferson County.

Ray & Kidney have been granted a new lease on the Columbia mine, north of Bernice.

Missoula County.

At the Tarbox mine, near Saltese, the management is pushing the winze from the 500 to the 600-ft. level. On the 400-ft. level a shoot of concentrating ore has been opened. Manager Daxon will put in a concentrator next summer.

Powell County.

The crosscut tunnel being run by the Montana Co., Ltd., owning claims 12 miles from Bonita, has been run 150 ft. from the bottom of the 200-foot shaft. R. S. Ellingsworth is manager.

Silver Bow County.

(Special Correspondence).—The Old Glory Copper Co. has acquired an interest in the Old Glory mine in Butte, of which F. A. Heinze owns a portion. The Old Glory was developed for silver many years ago but the operators struck copper at a depth of 400 feet and quit the property. During the past two years J. Benton Leggat has been prospecting the ground for copper and opened several veins which carry a fair percentage. The mine has not yet produced anything.——The Butte & London Copper Co. is making good progress in sinking a shaft on the Greendale. At a depth of 10 feet a vein was cut showing a good streak of copper ore.—— The West Butte Mining Co. was organized for the purpose of operating the Columbia mine which lies west of Butte and upon which there is a good sized shaft. Years ago the mine was worked for silver and about $100,000 worth of ore was mined from within 100 feet of the surface. The bottom of the shaft is in a copper-silver vein. The company has options on other properties. Several Boston men are interested in the West Butte.——The hoisting engine of the North Butte Co. has been repaired and the company is again hoisting about 1,020 tons of ore a day. While the damage to the engine was being repaired the Speculator ore was hoisted through the High Ore mine. The 1,020 tons of ore now being mined runs between 6% and 8% copper.——It is generally reported that John D. Ryan of the Amalgamated Copper Co. has secured an option for $1,000,000 on the mines of the Alice Gold & Silver Mining Co. The Montana Zinc Co. had an option on the mines, about 17 in number, a year ago, for something like $250,000, but allowed the option to lapse. At that time there had been no big strikes of copper in that section of the district and the Alice mines were generally regarded as old and worked out silver properties. The Alice has been mined to a depth of 1,500 feet, at which point a body of black zinciferous ore was cut which could not be mined and worked by the company except at a great loss. The Walker Brothers, of Salt Lake, are the principal owners of the Alice and they declined to invest any money for prospecting and the mines were closed. Except for little workings by leasers the mines have not been operated for a number of years. They lie northeast of the North Butte mines. ——Copper has been struck in the Poser mine, another old silver property, lying far north of the Alice group. The Poser has been worked for gold and silver for 20 years.

Butte, Jan. 5.

The Butte Copper Exploration Co., which was recently formed to take over the Six O'Clock mines, near Butte, has announced its intention of sinking the shaft on the Six O'Clock mine to the 1,200 or 1,500 level.

Manager Wethey, of the Butte Reduction Works at Butte, states that it will take nine months to repair the damage caused by the fire in the reduction works last week. He places the loss at between $250,000 and $300,000, with $200,000 insurance. The crushing machines at the plant were entirely destroyed.

NEVADA.

Esmeralda County.

The 30-ton Kinkead mill at Columbia has been started under the direction of Harry J. Kinkead.

It is expected that that the tubemill at the Combina-

tion mine, at Goldfield, will be running by February 15. It has a capacity of 40 tons daily, crushing to 200-mesh. At the same time the additional ten stamps, recently installed, will be started. The present 10-stamp battery is crushing 250 tons per week.——A 12-h.p. gasoline hoist has been put on the Diamondfield-Triangle property. ——Hugh Nelson and George A. Nelson state that they will build a sampling plant having a capacity of 200 tons per day at Goldfield.

A new discovery of high-grade ore is reported in the Palmetto district, 20 miles south of Goldfield and two miles west of the old Palmetto mill.

Eureka County.

The American Smelting & Refining Co. has bought the iron mine at Gerald, on the Southern Pacific, six miles west of Palisade.

Humboldt County.

The mines of the Willow Creek Mining Co., at Rebel Creek, which were sold recently, are to be equipped with a 200-ton plant and concentrators. The plant will be operated by electricity.

Lincoln County.

(Special Correspondence).—To the east of Las Vegas, along the Colorado river between 25 and 35 miles, near Callville, a large number of locations of free-gold ledges have been made. Some of the assays are high. While a number of the locators claim to have mines, the other fellows say the indications are good. From the number now there, and others going daily, the indications are good for a 'rush.' This belt is reported to be on both sides of the Colorado river, and the Arizona side is also being staked. —— The oil excitement to the northwest in this county is not so much talked of, but those having locations seem to be perfecting their entries.——There are some locations being made on what is called 'the Summit,' to the south and east from 10 to 20 miles. The assays so far are gold, silver, copper and lead.——Some work is being done to the northwest in Spring mountains on lead and zinc outcropping.——The steel on the Las Vegas & Tonopah Railroad is laid about 25 miles out and progressing very fast.

Las Vegas, Feb. 5.

The Searchlight Copper Gold Co. has given a contract to John Howe for 200 ft. of sinking on the Oom Paul claim at Searchlight. After the first half of the contract has been completed, a hoist is to be put in, and when the present contract has been completed, drifting and crosscutting will follow. The Searchlight Mining & Milling Co. has resumed work. Sinking will be started when the mill is completed.——The Searchlight Mutual Mining Co. will begin work on the American Girl claims at Summit Springs near Searchlight.

Nye County.

Ore is being sacked and shipments are soon to be made from the 400-ft. level of the Ohio-Tonopah, at Tonopah. Prescott Ely is superintendent.——The ore shipments via the Tonopah Railroad for the week ending February 2 were as follows: Tonopah Mining Co., 1,115 tons; Montana, 130 tons; Tonopah Extension, 698 tons; Belmont, 170 tons; Midway, 92 tons; West End, 42 tons; Briggs & Evans, 40 tons; Nevada Alpine, 29 tons; Duncan, Olson & Hedge, 15 tons.——The actual tonnage of ore shipments sampled by the Western Ore Purchasing Co., at Miller's, for the week ending February 1 was as follows: Tonopah Mining Co., 720 tons; Tonopah Extension, 583 tons; Belmont Development Co., 171 tons; Montana-Tonopah, 110 tons; Tonopah Midway, 91 tons; Goldfield district, 273 tons; Manhattan district, 31 tons; Hannapah, 17 tons. Total 1,978 tons.

It is expected that Bullfrog will be connected with the outside world by railroad not later than June 15. ——Track laying on the Las Vegas & Tonopah Railroad began at Las Vegas on the Clark road on January 4. Track material for 75 miles of road is now at the yards of the company at Las Vegas, and graders and track layers are pushing construction work. Eight days after beginning work, 10 miles of track had been laid, thus averaging 1¼ miles per day. The first point to be reached is Indian Springs, 40 miles from Bullfrog. When that point is made it is the intention of the railroad management to establish a line of freighters, to handle the business of the district temporarily, and also to maintain a passenger automobile line. It is promised that the rate on general freight will be 24c. per lb., which is a reduction of 1c. over the rate that has prevailed for some time from Las Vegas to that point.

A small compressor is to be put in at the National Bank mine at Bullfrog and the shaft will be continued 150 ft. from the 200-ft. level, running crosscuts every 50 ft. Superintendent E. H. Wedekind states that a mill is to be put up.——The No. 1 tunnel of the Gibralter at Bullfrog is in 360 ft. The No. 2 tunnel is in 225 ft. There are 700 sacks of ore stacked from this tunnel. The two tunnels are to be connected with an upraise. ——The Big Bullfrog crosscut is in 100 ft. from the 150-ft. shaft.——The Montgomery-Shoshone shaft is being sunk to a depth of 275 ft. and the Polaris to a depth of 200 ft. Connection will be made between the two shafts by a drift 471 ft. long. Awaiting shipment are 180 tons of ore to follow the last shipment of 30 tons, which will average between $225 and $250. The mill, of not less than 80 stamps, will be ready to bring in as soon as the railroad is completed, which is expected to be about June 1.

The following are the distances, taken by odometer, from Bullfrog to other points by stage, as published in the Bullfrog *Miner*: South—John Brunk's, 18.15 miles; Miller's Camp, 29.25; Ash Meadows, 38.50; Mesquite, 46.40; Fork Road, 51.65; Summit (no water), 63.15; Indian Creek, 79.15; Corn Creek, 100.15; Tule Springs, 111.15; Las Vegas, 124.15. North—Mud Springs (Currie's), 9 miles; Thorp's Mill, 31; Midway Station, 42; The Tanks, 52; Goldfield, 66; Tonopah, 94. Northeast—Rhyolite, 1.1 mile; Beatty, 5. East—Gold Center, 4.3 miles. Population of district, embracing the towns of Bullfrog, Rhyolite, Beatty, Gold Center and Original Bullfrog—estimated at 5,000. Cost of travel—To Goldfield, by stage $20, by auto $25. To Las Vegas by stage $25, by auto $40. Time consumed by stage in going to Goldfield, 12 hours; to Las Vegas, two days and one night; time consumed by auto to Goldfield, 7 hours; to Las Vegas, 10 hours.

Washoe County.

It is proposed to build a custom stamp-mill on the banks of the Truckee river at Wadsworth to reduce ore from the mines in the White Horse district. The mill could be run with electric power from the Wadsworth Light & Power Co.

White Pine County.

The White Pine Mining Co., consisting of Reno and Chicago people, has purchased six placer claims of 20 acres each from J. L. Wedekind and Jacob Mayer. The claims are in the Ruby Mountain district, 53 miles northeast of Eureka. The company has let a contract for the construction of a dam. The claims will be worked on a large scale with giants.

NEW MEXICO.

Grant County.

The Burro Mountain Copper Co. has put in an electric power and lighting plant on its property at Leopold, to supply light and power to its mine and mill.

The Comanche Mining & Smelting Co. is planning the construction of additional smelting furnaces of 250 tons capacity on its property near Silver City.

Luna County.

The *Mining Reporter* says that this county contains five mining camps. Cooks Peak is 20 miles north of Deming between the station of Cybar on the main line of the Santa Fe, and Faywood, on the Silver City branch. Florida district, is 12 miles southeast of Deming. Tres Hermanos district is 25 miles due south of Deming and near the Mexico line. Victorio district is 19 miles west of Deming, near the station of Gage on the Southern Pacific Railway. Carrizalillo district is 35 miles southwest of Deming, near the junction of the El Paso & Southwestern Railway. Lead is the most valuable mineral produced and is found in paying quantities in all the camps, except Carrizalillo, which is a gold camp. Zinc and silver are the next in importance, and some copper has also been discovered. The building of the Luna Lead Company's Smelter at the county seat, Deming, gave a great impetus to mining in Luna county. At Cooks Peak the ore is mainly lead carbonate. Among the main mines are the Desdemona, Otello, Monte Cristo, Graphic, Teel, Poe, Lead King group, Contention group, Wisconsin, Mocking Bird, Cleveland, Excelsior, Roosevelt, Big Galena, Monitor, Bonanza, Dewey, Olympia and Alto. This district is credited with a production in excess of $3,000,000. At Florida district lead-silver ore is the main mineral also, and the Silver Cave claim is credited with a production of $60,000. Among the other claims of prominence are Pocahontas, Sun Rise, Sun Set, Bear, Tiger, Iron Mass, Lead Carbonate and Roosevelt claims. There are a number of promising copper claims in this district also. In Tres Hermanos district the principal ore is also lead-silver ore and the formation is similar to that in the Florida district. The principal mines are the Cincinnati, Heetty, Hancock, Yellow Jacket, Contention and Johnston. Victoria district is credited with having produced $1,500,000 mainly in silver and lead. The St. Louis and Chance mines are the ones that made this district famous. Wolframite is also found in this camp. In the Carrizalillo district the main work has been done by the Golden Cross and Eagle Mining company and by Merril and Byron. This camp has abundance of wood and water. The Faywood Lead Co. have installed a pneumatic concentrator at their mines at Cooks Peak.

Otero County.

The owners of the Lucky mine, near Oro Grande, in the Jarillas district, are installing machine drills on their property.

Santa Fe County.

J. A. Wood, manager of the Gold Bullion Mining Co.'s placer workings at Golden, is putting in new machinery.

OREGON.

Baker County.

The owners of the California mine, at Cable Cove, have decided to remodel the mill and to complete the working tunnel.——The crushing capacity of the mill at the Tabor Fraction, at Bourne, is to be increased by adding rolls, and a saving of values will be made by putting in trommels, screens and settling tanks.

James A. Panting, owner and manager of the Gold Hill mine, near Durkee district, has let a contract to W. H. Potter to move his stamp-mill from its present location on the creek one-half mile to the mine.

Jackson County.

The Bill Nye mine, near Gold Hill, has been wired for electricity.

Josephine County.

J. L. Pennington is on Josephine creek, superintending the development of the Gold King quartz mine, near Kerby.

SOUTH DAKOTA.

State Mine Inspector Nick Treweek of South Dakota is at work upon his annual report covering the operations of the mines for 1905. In his judgment, based upon figures which he has collected up to the present time, last year will show an increase over the year 1904. Although the Government figures show a decrease as given out by Director of the Mint Roberts, Mr. Treweek believes he is in error, arguing that the increase of Homestake production alone would more than offset any loss in other quarters. A portion of the figures which have been collected by Mr. Treweek are as follows: Horseshoe, $254,745; Maitland, $288,000; Imperial, $251,000; Wasp No. 2, $100,000; Clinton, $86,471; Portland, $14,000; Monarch, $4,500. In addition to these quoted, there are a number of other companies to hear from, including the Clover Leaf, Hidden Fortune, Dakota, Homestake, Golden Reward, Spearfish, Golden West, Gilt Edge-Maid, Mainstay and Puritan. The present year will show an increase over the year just closed. A number of mills now being constructed will be in commission within the next few months. These include the Victoria, Safe Investment, Branch Mint and Eleventh Hour.

Lawrence County.

The new power plant which has been completed at Pluma by the Consolidated Light & Power Co. has a stack 210 ft. high of steel and concrete and a battery of seven boilers, with a capacity of 2,200 boiler horsepower and a total electrical force of 6,000 h. p. The company is building a pole line 30 miles long to connect mines in the Northern hills with the plant. Already the Lundberg-Dorr mill at Terry is using this electrical power. The Gilt Edge-Maid has electrical power for its mill and hoist. This company and the Rex Mining Co. have the only electrical hoists in the Black Hills. A line is being built for a pumping station at Ben Hur, one of the Horseshoe company properties, and it is expected that by June the work of connecting the various mining companies with the plant will be completed. It is estimated that the company will be able to furnish power for from 20 to 50% cheaper than it can be produced at the individual lines. The cost to the mining companies of the power to mill their ore is from 30 to 36c. a ton, and electrical power can be furnished for from 19 to 25 cents.

UTAH.

Salt Lake County.

Under the new management of the Butler-Liberal at Bingham it will not be necessary to use the hoisting plant for the removal of waste from the mine. Arrangements have been made with the Red Wing for dump room and all the material will be taken out through the tunnel, as was formerly the case.

Those in charge of construction at the new Garfield smelter are confident they will have a portion of the works ready to commence smelting ore May 1. There are 1,500 men on the payrolls. Three buildings have been completed—the machine shop, carpenter shop and warehouse. The steel frames for the sampling and sulphide mills are ready to be sided and roofed. Good progress is being made with the construction of the power-house. The steel frame is up and the brick walls are being built. The main building, which is to cover ground space of 300x360 ft., is well under way. The men building the 300-ft. stack are within 40 ft. of the top. The Utah Construction Co., which has been making all the excavations for the buildings and railroad trackage, is working with a reduced force and in another month will have its work practically finished. The Rio Grande Western has completed the grading of its branch line to the smelter yards, but it will possibly be a month before it begins to deliver freight to Garfield. The smelting company is still making excavations and grading a roadbed for its tracks.

Summit County.

The Odin Mining Co., of Park City, is extending its tunnel at 200 ft., further paralleling the main ledge.

WASHINGTON.

Ferry County.

S. P. Clark is extending the tunnel on the Unga group, in the Wauconda mining district, 12 miles west of Republic. The tunnel is being driven to connect with a shaft sunk on the ledge.

King County.

Work on a 12-mile spur to connect the Dutch Miller mine on Foss river with the Great Northern Railroad, four miles east of Skykomish, will begin April 1. The road will be built by the Seattle-Boston company of Seattle in exchange for a certain amount of the ore from the mine. The Dutch Miller is a copper mine on Foss river. The company will also build a tramway up the mountain to the mine. The Dutch Miller last season worked 14 men.

Okanogan County.

The Favorite Mining Co. has decided to run the tunnel at the Favorite mine, near Nighthawk, 500 feet further, and is now receiving bids for the work.——Manager Andrus of the Six Eagles mine, at Nighthawk, is adding new machinery.——John Boyd, president of the Palmer Mountain Tunnel & Power Co., of Loomis, states that the company has started a 300-ton stamp mill and a cyanide plant at Palmer Mountain. Electric drills and an electric haulage system are being installed. ——The Grand View Mining Co. has completed its 20-stamp mill at Palmer Mountain, near Loomis.

Charles H. Ballard, manager and principal owner of the Mammoth mine, in the Slate Creek district, states that there has been but little work done in the Slate Creek district this winter, but the arrangements that are now being made for the opening of spring promises a year of unusual development. The Mammoth mill will resume operations in May, and the power plant being constructed by James Cady and associates will be completed early in the season and will furnish power to the Chancellor and other mines of the district. Most of the concentrates for the operation of the past season have been stored, owing to the poor transportation facilities. The proposed lines of the Great Northern from Wenatchee to Oroville to connect with the boundary system, while running through the Okanogan country, will to a certain extent give the Slate creek better transportation facilities. It will eliminate the necessity of transporting freight by the Columbia river and shorten the distance necessary to operate pack trains at the present time.

Shohomish County.

Swan & McCain, of Spokane, have completed the installation of electric drills and lifts in the mine of the Sulphide Mountain Mining & Milling Co., 12 miles northeast of Orient. Other improvements just completed at the mine include a new boiler and hoist and two steam pumps.

Stevens County.

The Togo Mining Co. is developing claims 18 miles west of Springdale and one mile northeast of Deer Trail. The main tunnel is in 350 feet.

W. S. Magney, manager of the National Mining Co., at Northport, will begin work at the mine within a few weeks.

WYOMING.

Carbon County.

George H. Hand, the newly appointed superintendent of the Penn-Wyoming Co., will commence operations at the mines and at the reduction works, where extensive alterations will be made, including increasing the capacity of the smelter and the installing of a steam plant to enable the works to continue operations during the winter months. The proposed work includes operations at the lately acquired Doane-Rambler at Rambler, which shut down after its absorption by the Penn-Wyoming. A 3-mile tramway will be built to connect the Doane-Rambler with the main tramway to the Ferris-Haggerty mine to bring ore to the smelter.

FOREIGN.

AUSTRALIA.

The gold yield of Australia for 1905 amounted to 4,127,991 oz., valued at £17,544,000, as compared with 4,215,239 oz., valued at £17,915,000, in 1904.

New South Wales.

The gold output of New South Wales for December amounted to 27,763 oz., valued at £108,007, as compared with 40,414 oz., valued at £121,373, in the corresponding month of 1904. The output for the twelve months of 1905 amounted to 328,747 oz., valued at £1,165,013, as compared with 324,996 oz., valued at £1,146,109, in 1904.

Tasmania.

The report of the Mount Lyell Mining & Railroad Co., Ltd., for the six months ending Sept. 30, 1905, states that the company's mines produced 212,158 tons of ore, an increase of 6,284 tons over the preceding period. Of this amount, 208,282 tons (assaying 2.37% copper, 1.84 oz. silver and .058 oz. gold) were treated with 22,237 tons of purchased ore, metal-bearing flux, metallurgical residues, etc., resulting in 12,843 tons of matte (assaying 40.16% copper, 32.85 oz. silver and 1.139 oz. gold). This was blown to blister copper, amounting to 4,306 tons, and containing 4,253 tons refined copper, 365,440 oz. silver and 12,425 oz. gold, which showed an increase over the previous half-year of 303 tons copper, 1,189 oz. silver and 560 oz. gold. The cost of producing blister copper was $3.227, against $3.113 for the six months ending March 31, 1905, on account of the increased cost of mining in the North Mount Lyell mine. In this mine, which is of more recent development, considerable diamond drilling has been done, and much light has been thrown upon the position and extent of orebodies in the lower levels. The holes were drilled at each level, from the first to the seventh, inclusive, with varying results, the most satisfactory being at the 700-ft. level, where an orebody of considerable size was located. Underground exploration in all of the company's mines consisted of the following: Driving and crosscutting, 1,629 ft.; sinking and raising, 557 ft.; diamond drilling, 1,887 ft.; total, 4,073 ft. Of this total, 3,745 ft. was in the ground of the North Mount Lyell mine. Electric power is being substituted wherever possible. At the last named mine there is an electrically driven hoisting engine, and at the power plant there are two 400-k.w. steam turbine generator sets giving perfect satisfaction. On the average, four blast furnaces have been running continually during the period covered by the report, and have treated a larger tonnage than that of the preceding six months. Besides their mining operations, the company conducts a coke plant at Port Kembla, N. S. W. (which furnishes the entire coke supply for smelters and power plant), manufactures superphosphates and sulphuric acid at its chemical works, and operates railways, all of which enterprises are on a paying basis.

Queensland.

The Queensland gold returns for December (with calls made and dividends paid) were as follows:

	Tons Crushed.	Yield in Oz.	Calls.	Dividends.
Charters Towers	21,900	20,000	£6,500	£35,300
Croydon	1,200	700	300	.....
Gympie	21,100	13,600	3,600	4,200
Mount Morgan	20,000	9,400	.....	12,500
Ravenswood	3,300	3,100	500	.....
Other fields	6,200	2,500	.....	.....
Alluvial	.....	1,100	.....	.....
Total	73,700	50,400		

Victoria.

The Victorian gold yield for 1905 was 810,050 oz.

CANADA.

BRITISH COLUMBIA.

Boundary District.

The following official figures regarding the work done at the British Columbia copper company's Greenwood smelter for 1905 have been given out. The amount of ore treated amounted to 210.830 dry tons, the amount of custom ore received being 16,357 tons, the balance coming from the company's Mother Lode mine in Deadwood camp. The smelting tonnage figures for each month were as follows: January, 17,725; February, 16,634; March, 19.563; April, 15,866; May, 19,698; June, 18,413; July, 15,675; August, 18,561; September, 18,606; October, 18,374; November, 17,726; December, 13,989; 1905 tonnage treated, 210,830. The custom ore received during the year was as follows: Copper King, Chewelah, 183 tons; Le Roi No 2, Rossland, 5,039; Mountain Rose, Boundary, 3,269; E. P. U., Boundary, 121; Emma, Boundary, 2,417; Snowstorm, Idaho, 472; Sudbury, Boundary, 26; Mountain Lion, Republic, 198; Ben Hur, Republic, 1,261; Butcher Boy, Boundary, 8; Last Chance, Boundary, 58; Napoleon, Boyd's, 3,227; Ymir, Ymir, 78; total, 16,357 tons.

The Boundary smelting record for seven days was broken during the week ending Feb. 3. The several mines sent out ore as follows: Granby mines to Granby smelter, 18,079 tons; Mother Lode to British Columbia copper smelter, 2,976 tons; Brooklyn Stemwinder to Dominion copper smelter, 2,561 tons; Rawhide to Dominion copper smelter, 119 tons; Sunset to Dominion copper smelter, 710 tons; Oro Denoro to Granby and Dominion copper smelters, 732 tons; Emma to Nelson and British Columbia smelter, 231 tons; Providence to Trail smelter, 70 tons; total shipments for week, 25,478 tons; total for year to date, 104,474 tons. The following is the weekly treatment report from the three district smelters: Granby smelter, 19,088 tons; British Columbia Copper Co. smelter, 4,036 tons; Dominion copper smelter, 3,570 tons; total treatment for week, 26,694 tons; total treatment for year to date, 111,039.——Power over the West Kootenay Power & Light Company's recently completed high-tension electric lines from Bonnington Falls was utilized last week at the Granby smelter in Grand Forks. At first only a few hundred horsepower will be used, the Granby Consolidated having a water power of its own, as well as power from the Cascade Water, Power & Light Co. at Cascade, which has so far furnished all the long-distance power used by the mines, smelters and cities of the Boundary. The transmission of the Bonnington power gives an assurance against power shortage this winter, as occurred last winter when the Kettle river reached its lowest stage in years. Electric power has been turned on at the new air compressor of the Dominion Copper Co., Ltd., which is being installed at the company's Rawhide mine in this camp. This power is furnished by the Cascade Water, Power & Light Co.

The prospects for mining and smelting in the Boundary show that much new work will be undertaken in both low and high grade properties now operating, with others expected to resume, and the smelting capacity of the three Boundary reduction works will be increased from 25 to 40% before the year is closed. At present the daily output of ore runs between 3000 and 4000 tons, and from contracts already awarded for smelters' enlargement, it will be between 4000 and 5000 tons daily by the end of the year. At the Granby mines in Phœnix camp, the new main three-compartment incline shaft will soon break through to the surface, and the 250-h.p. electric hoist, capable of lifting five-ton loads from a depth of 1000 ft. or more, will be put in soon. An ore crusher, with a capacity of 3000 tons in 24 hours will go in on the Canadian Pacific Railway tracks, and will take the place of a similar crusher destroyed by fire in December. At the Granby's Gold Drop and Monarch claims, adjoining the main group, preparations are being made for taking out and shipping a large tonnage. At the former a sidetrack has been put in by the Canadian Pacific Railway, and ore bins have been built by the Granby people, which are connected with the No. 3 tunnel at the Gold Drop by a 600-ft. tramway. In another month the Gold Drop will add its ore to the general shipments from the Granby, and in the spring a 'glory hole' or open quarry will be opened on the property. At this property another large crusher may be installed this year. On the Monarch, in addition to the open work done last year, a shaft has been sunk 100 ft. and crosscutting is now going on. This property can also add largely to the Granby output when needed.

Rossland District.

The report of Le Roi No. 2, Ltd., at Rossland, for the year ended Sept. 30, 1905, states that ore and concentrate are smelted at the Greenwood and Trail smelters. The two smelters treated 9,013 and 3,224 tons of ore, respectively; the total charge for freight and treatment was $8.70 per ton. This was $1.06 higher than for the previous year, due to the increased value of the ore. Development on the Josie mine during the year comprised 2,685 ft. of drift and crosscut; 279 ft. raises and winzes, and 3,121 ft. of diamond-drill holes, costing $2.70 per ft. There were also stations cut amounting to 645 cu. yd. During the year the company has acquired eight properties in the vicinity of its own claims, two in the Rossland district adjacent to the Velvet mine, and five in the Ymir district. Concentration for the year was entirely by water, and resulted in an improvement over the previous year. The output was 425 tons of concentrate, averaging 2.54 oz. gold, 2.22 oz. silver and 2.61% copper; the smelter receipts for the same being $22,408. The total ore produced was 34,298 tons, which, after hand-sorting, was divided into 12,237 tons shipping ore, 10,678 tons second-class ore, and 11,293 tons waste. The total cost of ore, including diamond drilling, amounted to $4.222 per ton; this, with an additional charge of $3.38 for depreciation and equipment, brings the final cost to $7.60 per ton (calculated on a basis of 19,789 tons actually taken from the mine during the year). The decrease in output of the mine for the year was due to the restriction of work during the latter half in order to push exploration. The ore shipped, amounting to 12,237 tons, carried 14,493 oz. gold (1.184 oz. per ton); 28,369 oz. silver (2.318 oz. per ton); and 885,992 lb. copper (72.4 lb. per ton or 3.62%). The value of this ore was $35.78 per ton, as contrasted with $24.80 for the previous year.

Vancouver Island.

It is reported that ore has been struck at the 1,000-ft. level of the Tyee mine, on Mt. Sicker, 11 miles northwest of Duncan.

ONTARIO.

Announcement was made at the recent meeting of the Canadian section of the Society of Chemical Industry that in the spring a company would invest $1,500,000 in a plant to utilize the silver ores of Hastings county and to extract sulphuric acid by the contact process. Mr. Nieghorn, manager of the Canadian Chemical Co., London, made the statement. The plant will be near Tweed.

A move of importance to New Ontario, the refining of Ontario nickel in Ontario, instead of the United States, is to be forced by the Whitney regime. The adoption of the policy has been urged ever since the discovery of nickel at Sudbury. Announcement is made by the minister of mines of Cochrane that at the coming session of the legislature he will introduce legislation proposing that all the nickel mined in the province must not only be washed here, but converted into its marketable state, as well. At present the ores obtained in the Georgian Bay region are smelted and converted into matte at Copper Cliff. Something like 200,000 tons of matte annually are sent to Constable Hook, N. J., where they are subjected to further treatment and transformed into commercial nickel.

MEXICO.

Following is a translation of the recent order regarding mining locations: Department of Fomento, third section. Owing to complaints having been made by some foreigners to whom titles have been granted to exploit mines in the State of Sonora and the northern district of Lower California that they do not enjoy security and protection to work their properties, and having slandered the respective authorities in that they do not extend them protection, the president of the Republic has ordered that for the present and until further orders there shall not be admitted in the mine agencies of the same States and districts applications to acquire mines that may be presented by foreigners. This I communicate to you to the end that you do not admit any application whatsoever presented by foreigners for mines within the jurisdiction of your agency; at the same time you must suspend further action in all applications that come within this ruling. You will acknowledge receipt of the present communication and advise that you have informed yourself of the same for its immediate compliance. You must transmit to this department a detailed statement of all applications refused by you, as well as of those that you suspend, which come under this ruling. By order of the acting secretary.—Guillermo B. Puga.

Guanajuato.

Ignacio Ibarguengoitia, of Guanajuato, is preparing to substitute the cyanide process for the patio process in the reduction of his ores.

Jalisco.

The Boca Ancha mine, in the Parnasso district, 60 miles southwest of Ameca, is to be worked by the Boca Ancha Mining Co., of which Geo. E. Purnell, of Guadalajara, is manager. A 10-stamp mill and cyanide plant are to be put in and new development work started.

Sonora.

(Special Correspondence). — The railroad is being pushed from Batamotal, near Guaymas, to the Yaqui river, where it follows the river as far as Tonichi. Many of the mines are producing, but are not shipping on account of difficulty of transportation. The Buena Vista mine has been producing ore for the past year.——The Ubalama mine in running a tunnel 125 ft. took out 12,000 oz. in silver.——The Gold Coin Santa Rosa Mining & Milling Co. are operating their smelter.——The Indians are still quite active in their depredations in this section, but it is believed that when the railroad enters the field they will have to go farther into the interior, as the Government will be called upon to protect the railroad interests, and people can then enter the district without fear of being molested.

San Javier, Feb. 3.

The Veta Grande Mining Co. has ceased operations at the Veta Grande mine, near Cananea, owned by James Finch.——The headquarters of the Greene Gold-Silver Co. are to be removed from Temosachic, the western terminus of the Chihuahua & Pacific railroad, to Santa Tomas, on the same line.

Books Received.

'The Nature of Ore Deposits,' by Dr. Richard Beck, translated and revised by Walter Harvey Weed, is a work which is certain to provoke interest among students of ore deposits. Dr. Beck's original book, in the German, had already won a high reputation before Mr. Weed widened the usefulness of the treatise by translating it into English. The opening chapter, on magmatic segregations, in which the author reviews the work of Kemp and Vogt, forms an excellent introduction. Mr. Weed has given a sympathetic rendering of the original and he has added illustrations, with data, which tend to bring Dr. Beck's book in closer touch with recent developments. It is to be regretted that the mechanical part of the book-making is not better; the printing is not as good as it ought to be, the second volume opens in the midst of a chapter, a Procrustean method by no means necessary. Clayton's law is wrongly quoted; what he said was that the ore-shoots conformed in pitch to the striations on the vein-walls. Certain cuts are wrongly labeled; Fig. 103 is a normal, not a reverse, fault. Some of the chemical equations do not balance and several statements appear to include arithmetical errors. The retention of Germaa terms on illustrations of American lode-occurrences annoys the reader. However, in making these criticisms, we desire mainly to emphasize the fact that in these days, when poor fiction is published in beautiful dress and with the highest effort of the printer's art, there is no excuse for issuing a valuable and expensive treatise such as this so poorly printed and insufficiently proof-read. Despite these drawbacks, the book is bound to be welcome to specialists in ore deposits and to progressive mining engineers. It is published by the *Engineering and Mining Journal* of New York City, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $8.

Trade Treatises.

The Richards' Rapid Economy Stamp Mill Co., Examiner Building, San Francisco, illustrates and describes their mill in a neat catalogue.

Smith, Emery & Co., 83 New Montgomery St., San Francisco, send a folder listing the classes of analytical work for which they are prepared.

The 'Application of Electricity to Mining' forms a handsomely illustrated bulletin from the Jeffrey Manufacturing Co. of Columbus, Ohio. Typical installations for electric haulage and coal mining are shown.

Personal.

F. W. BAKER is in New York.

F. L. BOSQUI has gone to Chihuahua.

H. A. SHIPMAN has returned to Denver.

N. C. BONNEVIE, of Denver, is at Chicago.

F. W. BRADLEY has returned from New York.

F. J. ESTEP of Oroville has been in San Francisco.

JAMES DOUGLAS has returned to New York from El Paso.

W. E. BASHAM, of Placerville, is at the California Hotel.

DAVID LEVAT of Paris is examining gold mines in Arizona.

W. H. KNOWLES, Denver, Colo., is visiting New York and Boston.

J. N. ESSELSTYN, of New York City, is at the St. Francis Hotel.

WM. M. BREWER, of the Tyee Copper Company, is visiting Tonopah.

R. C. GEMMELL has returned from Spain and is now at Salt Lake City.

W. H. WILEY passed through San Francisco on his way to Los Angeles.

ARTHUR THACHER of St. Louis is examining mines in the Indian Territory.

RUFUS M. BAGG, JR., has returned to Chihuahua, Mexico, from Los Angeles.

EDWARD STOIBER has left Denver for New York, and will shortly return to Paris.

W. H. SHOCKLEY, on his return from Siberia, is now examining mines in Nevada.

O. LONGACRE JR. is superintendent of the Poland Mining Co. at Poland, Arizona.

HENRY F. LEFEVRE has left New York to open an office at Managua, in Nicaragua.

EDWARD SKEWES, lately at Sonora, Cal., has gone to examine mines in Jalisco, Mexico.

CURTIS LINDLEY, JR., is now with the Nevada Consolidated Copper Company at Ely.

J. M. CALLOW is on his way to Europe, expecting to return to Salt Lake City on April 1.

JOSEPH LUXON has been appointed manager Cyrus Noble mine, at Searchlight, Nevada.

J. W. CLEAVER, San Javier, Sonora, Mexico, has returned there from Denver, Colorado.

C. M. FUELLER, Denver, Colo., is examining mines at Wickenburg and Tombstone, Arizona.

F. H. CARNAHAN is superintendent of the Blue Ledge copper mine, near Jacksonville, Oregon.

EDWARD M. L. ENGLE has charge of the Mount Union Consolidated mine at Walker, Arizona.

SAML. A. PARNALL is said to have resigned as manager of the Bonanza Circle mines at Bisbee.

DAVID GOODALE is manager of the Minas de Cobre de Rio Tinto, at Terrazas, Chihuahua, Mexico.

H. M. HALE has charge of the copper mine owned by W. B. RAMSDELL, of Los Angeles, California.

M. D. STACKPOLE, Denver, Colo., has charge of construction of a mill at San Luis Potosi, Mexico.

WILLIAM THOMPSON is with the Waterson Gold Mining Co., at Ocampo, in Chihuahua, Mexico.

HERMANN A. PROSSER, who was at Mammoth, Shasta county, this week, has returned to Salt Lake City.

FRED CARROLL, manager Atlas Mining Company, Ouray, Colo., has returned from Chicago and Denver.

A. STARK, manager of the Slough Creek placer mines near Barkerville, B. C., is visiting Oakland, California.

WILLIAM H. RADFORD, of San Francisco, is investigating dredging ground in Clear Creek county, Colorado.

JOHN T. MILLIKEN has been appointed superintendent of the remodeled Telluride mill at Colorado Springs.

JOHN H. FENNELL, lately on the staff of the Rio Tinto mines, has joined his brother, CECIL G. FENNELL, at Prescott, Arizona.

WALTER G. PERKINS, smelter superintendent for the Nevada Consolidated Copper Company, will remain in San Francisco a month.

E. J. WILSON has returned to Spokane after finishing the construction of the plant of the Arizona Smelting Co. at Humboldt, Arizona.

ARTHUR L. WALKER has gone to the Tacoma smelter, in his capacity as consulting engineer to the Guggenheim Smelter Securities Corporation.

W. S. MANN, engineer for the Montezuma Mines, Inc., of New York, has gone to Miramar, Costa Rica, C. A., to begin the construction on their new mill.

C. O. ELLINGWOOD, of Salt Lake City, has been elected to succeed WILLARD F. SNYDER, resigned, as president and general manager of the Western Exploration Company.

W. L. LIBBEY has resigned as president and general manager of the Brookfield Mining Co. in Queens county, Nova Scotia, and will take charge of mining interests in Chihuahua, Mexico.

Latest Market Reports.

SAN FRANCISCO, February 8, 1906.

ANGLO-AMERICAN SHARES.

London, February 8, 1906.

	£ s d		£ s d
Camp Bird (ex div.)	1 9 3	Oroville	1 0 0
El Oro	1 7 6	Stratton's Independence	0 8 3
Esperanza	4 7 6	Tomboy	1 8 0
Dolores	2 1 3		

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. February 8, 1906.)

Amalgamated	$114	North Butte	$ 86
Anaconda	273½	Old Dominion	36½
Bingham Copper	48⅝	Shannon	6⅛
Daly West	16	Tennessee Copper	47
Granby	10	Tonopah-Nevada	18
Greene Consolidated	27¼	United States	59¾
Nevada Con. Copper	12⅛	Utah Copper	32¼

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 20	Ophir	$6 00
Hale & Norcross	0 95	Potosi	0 13
Mexican	1 30	Savage	0 41
Exchequer	0 41	Yellow Jacket	0 10

[Tonopah and Goldfield.]

Belmont	$2 97½	Montana-Tonopah	$2 72½
Golden Anchor	1 32½	Ohio-Tonopah	0 42
Jim Butler	0 86	Red Top	2 00
Jumbo	1 42½	Sandstorm	1 35
Kendall	0 74	Tonopah Ex	8 37½
Midway	1 85	West End	1 95

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 65⅝c. per fine ounce; San Francisco, 65⅝c.; London, 30 1/16d. (standard ounce, 925 fine); Mexican dollars, 51@53c., San Francisco; 50½c., New York.

COPPER.—New York (by wire, average for week ending Feb. 8), Lake, 17.75@18c.; Electrolytic, 17.62@17.87c.; Casting, 17.50@17.62c. per pound. Mill copper plates, $21.00; bars, 21@24c. London: £77 spot per ton.

LEAD.—New York (by wire, average for week ending Feb. 8), $5.60 per 100 lb; San Francisco, pig, 6.55@6.78c. per lb.; pipe 8@8½c.; sheet, 9@9½c.; London: £16 5s. ℔ long ton.

SPELTER.—New York (by wire, average for week ending Feb. 8), $6.07 ℔ 100 lb.; London, £26 17s. 6d. ℔ ton; San Francisco, ton lots, 7c.; 100-lb. lots, 7¾c.

TIN.—New York, pig, $35.90@36.15; bar tin, ℔ lb., 42¼c.; pig, 39c. London, £164 10s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d.; San Francisco, local, $37.50@39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 33@37c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.50; gray forge, $17.25; San Francisco, bar, 3½c. ℔ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00 open hearth billets, $27.50; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8½c.; less than 500 lb., per lb., 8¾c.; in 25-lb. tin pails, ½c. ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ½c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8½c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 14c@15c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8½c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11¾c; 14 oz., 10@10½c; 12 oz., 9½@9¾c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6½@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17c; Astral, 17c; Star, 17c; Extra Star, 20c; Eocene, 19c; Elaine, 26c; Water White, in bulk, 10½c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24½c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 15½c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 65c; cs., 70c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 53c.; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 57c.

COAL.—San Francisco, coast, yard prices to dealers: Wellington, $7.50; Seattle, $6.50; Coos Bay, $5.50; Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $14.00; Cannel, $8.50; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—98@99% N. Y., $1.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lb. and over at one purchase, ℔ lb., 8¼c.; less than 500 lb., 8½c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., 90c.

URANIUM.—Oxide, ℔ lb., $3.40.

Commercial Paragraphs.

J. J. MENDEZ & CO. advise us that they are organized as representatives and agents for mining companies, with headquarters at Gante 8, Mexico, D. F.

BAVERSTOCK & STAPLES, assayers and metallurgists, have moved their Los Angeles office to larger and more commodious quarters at 223 West First street.

W. C. BOGUE, formerly manager of the Salt Lake City branch, has been appointed local manager of the Denver, Colo., branch of the Mine & Smelter Supply Co.

THE General Engineering Co. announces its incorporation, with temporary offices in the Dooly Block, Salt Lake City. They are prepared to do a general mining-machinery business.

THE De La Vergne Machine Co., of New York, claims the enviable record of having sold the largest gas-engine power plant, the largest ice plant and the largest oil-engine power plant in the world.

W. H. TRAVER has severed his connection with the Ingersoll-Rand Company, and accepted services with the Chicago Pneumatic Tool Company as manager of the mining and contract department.

RAPID-ECONOMY STAMP MILL CO., of San Francisco, report the installment of a number of their Richards' rapid-economy stamp-mills on the Salto de Agua Mining & Milling Co.'s property, about 100 miles southwest of Durango, Mexico.

THE Western Gas Engine Co. report installations as follows: 60-h. p. plant Anaheim Union Water Co.; nine engines for use at the government's reclamation works above Yuma, Arizona; 50-h. p. at Fayette, Idaho; two 60-h. p. at the Huntington Beach Co.'s. electric light and water plant; one for Monrovia water works.

Obituary.

NORTON A. WEBSTER, of Berkeley, Cal., was killed February 5 by asphyxiation in the Blue Bird mine, at Cripple Creek, Colo.

FORMER STATE SENATOR CHARLES NEWMAN died at Durango January 31 of pneumonia. He served in the State Senate from the counties of La Plata and Montezuma. He was actively engaged in mining and was one of the discoverers of the Yankee Girl mine.

Dividend.

February 2 the Bunker Hill & Sullivan Mining & Concentrating Co. declared dividend No. 100 of $180,000, payable on the 5th inst. This makes the total paid since January 1, 1905, $3,615,000, and total to date $5,886,000.

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SAN FRANCISCO, FEBRUARY 17, 1906.

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EDITORIAL.

OUR 'Prospector' department is evidently appreciated, and it will be our endeavor to make it useful. It is in charge of Mr. W. H. Storms, whose long association with this paper is well known. That the determination of rocks and minerals is accurate, is shown by a letter from a mining engineer in Mexico who sent 13 samples to us in January. He writes to say that he himself made a careful examination with the microscope and found the determinations published in the MINING AND SCIENTIFIC PRESS to be "absolutely correct, except in one instance, and in that there is some doubt."

SOME of the romance that flourishes in the absence of accurate knowledge has been dissipated by recent investigations into the origin of the celebrated ruins at Zimbabwe, in south-central Africa. It appears, according to Dr. McIver, who examined these architectural remains, that they are not as old as supposed and that instead of being the work of a highly civilized Semitic race of unknown derivation, they were constructed by a negroid people akin to the Kaffir, who carried on primitive mining and metallurgical operations until the Zulus scattered them and destroyed their community. Romance is fair, but knowledge is fairer; therefore we hope that the new explanation, reasonable in itself and in accord with the few facts in the case, will be confirmed in the course of further investigation.

DETERMINATION of value by formula may seem academic to most people who appraise mines, but when all is said, a formula is but the mathematical statement of logical thought. The note on this subject, from Mr. Newton B. Knox, is interesting because his formula has been used in a practical way by several experienced engineers. It pre-supposes a mine well developed and thoroughly sampled, with ore reserves large enough to ensure a life of several years. While methods of valuation based on personal experience are necessary to successful practice, there is no reason why the principles that underlie them should not find mathematical expression.

MINERALIZATION is a term which came by the back-stairs of etymology, but it has won its place in mining literature. The French *mineralisation* and *mineralisé* have a different significance from the words we use, for theirs signify 'ore-bearing,' *minerai* being the French for 'ore.' They have both *mineral* and *minerai;* we have 'mineral' and 'ore,' and we confuse them, making the first do the work of the latter. We have no means of distinguishing one kind of mineralization from another, except by adding other words of description. We mineralize a block of soft porous sandstone, if we wet it with water; for water is a mineral. If it is a block of sandstone which is iron-stained, it is mineralized by the iron in the strict sense of the word. But in the sense in which the miner, and those who have to do with mines in a practical way, understand the word, mineralization is the impregnation of the rock with ore, brought in from the outside. It is to be regretted that we have no distinctive words to express these radically different meanings.

The Amalgamated and Mr. Heinze.

The telegraphic despatches announcing the cessation of the bitter feud between the Amalgamated Copper Company and F. Augustus Heinze, through the purchase of the latter's interests by persons friendly to his opponents, is said to have given great satisfaction in Montana. It ought to; the fight between that Apache of finance, who has added to ancestral instincts for business the technical training of a Columbia School of Mines graduate, and a corporation directed by all the buccaneering skill of modern industrial rapacity, has been a standing disgrace to what we proudly call civilization, that is, the art of living decently in communities. The judiciary of a State has been debauched, its politics mired, its people obsessed, while two parties of mine-owners have twisted our awkward mining laws to the acquirement of territory and the destruction of property. Most unprejudiced observers will have taken the stand of Mercutio and called a plague on both parties to the controversy, because there was little to choose between them as regards the methods they used, for if Heinze was unscrupulous in pushing his demands, he met with similar tactics, the disreputable nature of which had already been established by Marcus Daly at an earlier date.

The cessation of a litigation involving something like a hundred lawsuits is a blessing to the mining industry. These cases have bred many personal quarrels, and, on the whole, they have been distinctly injurious to the good standing of the mining engineering profession, because they caused men to pose as scientific witnesses who were, to all intents and purposes, skilled advocates. The trial of cases involving complicated questions of geology before a jury selected largely for its lack of acquaintance with such matters, and the lecturing of such jurymen by technical men of high standing, who re-constructed creation in the interests of a mine-owner or a mining company, afforded a spectacle the scandal of which was relieved only by the humor of it. It is true that the exploratory work carried out as an aid to the preparation of testimony to be offered in the course of the litigation did lead to the discovery of many orebodies and furnished an increase of knowledge concerning the mining geology of the Butte district, but the price paid—from a professional point of view—was too great.

To the technical men in Montana this cessation of hostilities will afford keen pleasure; both parties to the quarrel have on their staffs some of the very best professional talent in America, and to these men the opportunity to go ahead with their useful labors, unhindered by a mixture of frontier barbarism and ward politics, will be a distinct gain. To them the tactics of their employers must often have been particularly distasteful, and to them the arts of mining and metallurgy will always appear best when free from alliance with predatory finance.

Distribution of Ore.

In this issue we publish the last of a series of four articles, by Mr. Walter P. Jenney, in which that experienced mining engineer has described and discussed the ore deposits of the Ontario lode, in Utah. The explanations offered are full of interest, because they may prove applicable to other regions. His cross-section of the Ontario lode should invite investigation, because the extent to which occurrence of ore is affected by change of wall-rock has long been one of the fundamental problems of mining geology. In this case rich ore, from three to eight feet wide, persisted from near surface to a thousand feet, at which horizon the lode became less productive, the impoverishment coinciding with a change of formation; for while both walls were quartzite down to 1,000 feet, the foot-wall became shale at that point. Coincident with this condition, the lode widened until it was as much as 250 feet, but the streaks of rich ore within this large width were so far apart that they became less profitable to mine. This condition began where the foot-wall was shale and became emphasized when the hanging also became shale, with limestone on the foot, that is, the lode follows a fault-fracture showing a dislocation of not less than 500 feet, which is approximately the thickness of the shale beds. It is a nice question whether the enrichment down to 1,000 feet was influenced directly by the nature of the quartzite, and, similarly, whether the impoverishment deeper down was due to any quality in the shale.

Is it not possible that the structural conditions explain the latter, and secondary action the former? Thus, it will have been noticed that the lode flattens in the shale beds, because it was easier for the fracture to travel along, rather than right across, the lamination; instead of a clean-cut fissure there was a big width of shattered rock which prepared the way for a large mass of scattered ore. In the quartzite, the fault-fracture cut almost at right angles across the bedding of that hard, close-grained rock and made a narrow fissure, which tended to restrict ore deposition within narrower limits. These conditions are often reproduced on a smaller scale, where a fair width, four or five feet, of medium grade ore gives place, either in strike or dip, to a narrow seam of rich stuff. Such cases are usually due to a change of structural conditions. Furthermore, we usually expect to see gold and silver lodes richest within a certain depth from their outcrop, because the leaching of the upper part—often eroded portion—of the vein yields solutions which in their descent tend to add to the original metal-content of the ore; in fact, Dr. Jenney recognizes this, for he mentions a zone of oxidation followed by one of secondary deposition. Why, then, impute the poverty of the vein

below this horizon to the effects of the wall rock?

The evidence for the influence of the enclosing rock upon the distribution of ore is much stronger in the case of the contact deposit which follows the stratum of soft gray limestone—25 to 35 feet thick—that occurs some distance above the quartzite. In this regard the vertical section of the Daly-West mine is particularly instructive. Ore is found along the Ontario-Daly fissure, and apparently it occurs with equal generosity where the hanging wall is 'Black lime,' 'Gray lime,' 'Upper quartzite,' 'Cherty limestone,' or 'Ontario quartzite,' throwing doubt on the agency of any particular formation in producing conditions especially favorable to its deposition. It must be pointed out, however, that the foot-wall is quartzite throughout this section, while the 'horses' inside the vein are torn from the hanging. But the selective action of the mineral solutions is clearly suggested by the 'contact' formation which follows the 'Gray lime,' producing a flat ore-measure which appears to have been fed by the various fractures that were produced by the faulting of the region. It appears true that the gray lime afforded a soluble stratum in which the ore was deposited by replacement, but even in this case we may properly inquire whether structural conditions were not as decisive as the chemical composition of the rock. This 'Gray lime' is a particularly fragile and brittle rock, says Dr. Jenney; these characteristics caused it to be so crushed and shattered as to influence the deposition of ore. So the physical conditions were important; why were they not decisive? This bed of gray limestone is overlaid by a 'black lime,' which is really a finely laminated carbonaceous shale; when the rocks underwent rupture this 'short'—as the miners call it—or brittle limestone was crushed, while the more pliable layers of black shale above it were simply distorted and bent. Subsequently any tendency for chemical interchange between the mineral solutions coming up the vertical fissures was rendered effective by the shattered condition of the gray lime, affording a permeable stratum and offering large surfaces for chemical attack, while overhead the shaly rock formed an impervious roof that prevented the upward distribution of the enriching waters. The influence of such barriers is at least as important in the distribution of ore as the chemical composition of the wall-rock.

Australian Development.

The Hon. Daniel O'Connor of Australia—as the local press describes him—has arrived from the Antipodes on a lecturing tour. His enthusiastic descriptions of the continent under the Southern Cross make even a Californian feel that his manner of describing his own State is modest indeed. Most countries can be viewed from at least two points of view, otherwise the congestion of population in some of them would soon become unbearable, and Mr. O'Connor regards his own habitat through the glowing imagination of a cultured Irishman; nevertheless his description of the mining potentialities of Australia must not be permitted to attract too many of our citizens to the other side of the world. He says "We need you Americans and your scientific methods. Strange as it may seem, mining is still conducted on comparatively primitive lines compared with the American advanced system." And yet not so altogether primitive. The Mt. Morgan gold mine has produced $56,891,000 and is still yielding $2,800,000 per annum; the Broken Hill Proprietary has produced $132,816,003, and paid $38,722,400 in dividends, and is still adding $8,000,000 annually to the metallic wealth of the world; at Kalgoorlie, in Western Australia, there is a golden square mile of mining territory that contributes about $22,000,000 per annum; and in Tasmania the Mt. Bischoff tin mine has paid $10,040,000 in dividends. We can afford also to differ from Mr. O'Connor when he emphasizes the present crudity of method in Australia as indicative of the possibilities within the reach of scientific engineers, because of late years American experience and energy has been abundantly applied to Australasian mining—at least at Broken Hill and in Western Australia. The fact is, there is plenty of undeveloped wealth in North America and in that part of it included within the limits of the United States. Our friends will do well to remember the proverb that says "the oxen furthest from home have the biggest horns."

The Survey and the Technical Press.

The unrestrained journalistic activities of the members of that branch of the Government service known as the United States Geological Survey have been placed under restraint by a recent order promulgated by the Director, Mr. Charles D. Walcott. The exact amount of literary freedom permitted to the officials of the Survey, in connection with technical publications, is prescribed in a letter which we publish on another page. It is well that the matter should be generally understood, for such public understanding will prevent the recurrence of another scandal similar to that which occurred last year. Of the attempt made by one or two of the officers of the Survey to control a Chicago mining periodical and the effort of the publishers to subvention the members of that Government department, the best that can be said, and all that need be said, is that it was a miserable failure. And this was fortunate for all concerned, except a few subordinates whose small salaries became involved in the fiasco. In that affair, the Director's name was freely used, and other proceedings took place of such a character as to have involved the Survey seriously, had not the protest of a geologist, once a member of the Survey, precipitated a vigorous newspaper criticism, followed by an enquiry which put a stop to further alarums and incursions. That episode is now buried and, let us hope, will soon be forgotten.

With the Director's recent instructions, there is but little fault to be found; in the main they are reasonable and judicious. Within certain limits it is obviously to the public interest that the observations and ideas of the government geologists should gain the widest publicity possible, for their ideas and observations are of immediate value to the mining industry for the benefit of which the scientific corps to which they belong was primarily organized. At the same time, official reports should not be anticipated and serious differences of opinion—especially as to facts—ought not to be ventilated *coram populo*, for such action is prejudicial to the usefulness of the organization to which the geologists belong.

Speaking from the standpoint of those engaged in technical journalism, we agree that there is question as to the propriety of government geologists being identified—as editors or directors or shareholders—with any technical or trade paper. The plan of having such gentlemen as 'special contributors' to a reputable journal answered well enough until it was prostituted to purely commercial ends. In order to prevent complication, arising out of any attempt to make close distinctions, the Director has put his veto on this pleasant courtesy also; and he is undoubtedly wise.

Finally, he defines this prohibition as applying only to "technical and trade papers conducted as business enterprises" and excepts those journals which are "devoted entirely to the dissemination of scientific knowledge and which are not conducted for profit or as business enterprises." Well, here are distinctions which each man can make for himself. They remind us of the old English idea that an honorable business was inferior to a scientific pursuit. If *Science* and *Economic Geology* are not conducted as business enterprises they will be short lived; which would be a pity. Because a paper is frankly a business enterprise conducted with an honorable purpose, in which the idea of being useful is at least as prominent as the notion of gain, it is not necessarily less worthy of the support of good citizens than a scientific journal which serves as the spokesman of a group of talented men. Between a trade paper frankly using its reading matter as a lure for advertisements and a class journal supported wholly by subscriptions, there is room for many kinds of journalistic enterprise, but we do not accept any hard and fast classification such as that of Mr. Walcott. The papers he mentions—and may they prosper—accept advertising matter, and if the amount of this be small, it is not necessarily due to self-denial; this fact, we hold, places them alongside the technical paper which is mainly supported by such sources of income. The definitions obtaining in sport hold good: a paper which accepts pay for anything that it publishes, inside or outside, is a professional or trade paper; the journal that receives money only from subscriptions is an amateur or scientific periodical.

By the Way.

Mr. O. P. Austen, Chief of the Bureau of Statistics, has made certain interesting comparisons between the trade and transport of the Orient. He said:

The population of Asia and Oceania is 850 millions, while that of all other parts of the world combined is but about 750 millions. Its land area is 18 million square miles, and that of all other parts of the world 34 millions; yet its commerce is slightly less than three billions of dollars, and that of other parts of the world 19 billions. This gives an average commerce in the entire Orient of about $3 per capita per annum, while the average in all the rest of the world combined is $27 per capita. Thus the Orient, which has more than one-half of the world's population and more than one-third of its land area, has now but one-ninth the average per capita in all other parts of the world. That region which we term the Orient, while it has more than one-half of the population and one-third of the land area of the world, has but about one-tenth of the world's railways and less than one-tenth of its telegraph lines. The people of the Orient are, as a rule, industrious, painstaking, and now disposed to commercial intercourse with the Occident, but without facilities for transporting their products from the interior to the seaboard, where they may sell or exchange them for products of the other parts of the world, they are powerless to develop commerce.

China, India and Japan have about nine-tenths of the population of what is generally known as the Orient, and the relative development of commerce to railways is most suggestive. Railway construction in India began about 1853, but did not make rapid development until more recent years. In Japan railway building began about 1872, but most of the development has occurred during the past decade. In China nearly all of the railway now existing has been constructed since 1900, and under circumstances which have not permitted its development as a system which would have material effect upon commerce. We may, then, fairly compare the growth of commerce in these three great Oriental countries, two of them with young but rapidly developing railway systems, the other with practically none.

The foreign commerce of China, with its 400,000,000 industrious people, but no railways, has grown but $160,000,000 since 1870; that of India, with 300,000,000 people and a system of railways, has grown $258,000,000, and that of Japan, with only 45,000,000 and a system of railways, has grown $215,000,000. The Chinaman is known by those familiar with the conditions in the Orient as a natural trader and business man. A large share of trade in the Orient is in Chinese hands, and the positions of trust in the great banking establishments are largely held by Chinamen; yet, despite these commercial characteristics of the Chinamen, the foreign commerce of China, with no railway system, is but 85c. per capita; that of India, with 28,000 miles of railway, is about $2.25 per capita, and that of Japan, with 4 500 miles of railways, is $5.86 per capita. In other words, the commerce of China, without a system of railways, is about one-third as much per capita as that of India, and one-sixth as much per capita as that of Japan, each of which has but one mile of railway for each 10,000 inhabitants.

But there is another feature of this recent railway development in the East which must be considered as likely to prove of great importance in the future relations of the Orient with the Occident. China has 2,000 miles of railway, most of it connected with the great Trans-Siberian line, and several thousand miles more have been authorized or definitely proposed. French Indo-China, lying just at the south of China, has over 1,000 miles constructed and many new lines projected, while the Malayan peninsula, still farther to the south, has some 300 miles, Siam about 350 miles, and Burmah 1,500 miles. The French Indo-China system is to be connected with the railways of China by a line 230 miles long, now under construction, at a prospective cost of some $20,000,000. The railway lines under construction or projected in China promise to extend to her southwest border, where a few hundred miles of railway would connect them with the systems of Burmah, which in turn will connect with that of India, about 28,000 miles in length.

From India the railway system again stretches westward into Persia, and the construction of but a few hundred miles would put this great system into communication with the 2,000 miles of road in Asiatic Turkey, which in turn connects with the railways of southern Europe, while a comparatively short stretch of road at the north of India would also connect the Indian railway system with that of Russia. While it is a fact that serious political obstacles to some of these unions of railway systems now exist, it is not unlikely that the demand of commerce will in time be sufficiently strong to overcome or sufficiently modify these political conditions and to render possible a union of these numerous systems, great and small, so far as relates to an interchange of passengers, freights, mails, and the establishment of other transportation systems between the railroads of Europe and those of Asia.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

COPPER is softened by heat and loses tensile strength thereby.

ELATERITE is one of the hydro-carbon minerals, a species of elastic bitumen.

KAOLIN results from the decomposition of feldspars and other aluminous rocks.

NO MINING CLAIMS may be located on Indian reservations, though claims may be taken on forest reserves.

IN measuring the cross-section of a stream, measurements should be made at 10 or 12 places and a mean of the depths taken.

COMPRESSED-AIR VEHICLES for metropolitan use have been almost wholly succeeded by the modern motor car or automobile.

SEVERAL 'compounds' are manufactured for the removal and prevention of boiler scale. Different waters require different remedies.

FLUORITE (fluor spar) is calcium-fluoride. It has various commercial uses. In a few instances it is employed as an ingredient of portland cement.

A PECULIAR occurrence of lead-zinc sulphide has been observed in Moniteau county, Missouri, where galena and zinc blende occur in small fissures cutting beds of coal.

GRANITITE is the name given to a granitic rock which contains soda-lime feldspar as well as orthoclase feldspar. The latter in such rocks is usually pink, and the mica occurs sparingly.

THE greatest square that may be described within a given circle may be ascertained by multiplying the radius by 1.4142, or the diameter by 0.7071. This gives one side of the square.

MECHANICALLY rabbled furnaces have a greater capacity than those that are hand rabbled. If the roast is incomplete it is probable the rabbles travel too fast, or the furnace is too short.

IN concentration, the greatest care should be observed to crush ores only as fine as necessary to free the metallic particles or sulphides from the gangue. When sliming takes place troubles multiply.

THE exhaust of a gasoline or gas engine may be deadened by connecting it with a box or cylinder somewhat larger than the exhaust pipe, and in which are several diaphragms of ⅛-in. wire cloth.

THE chief difference between a dynamo and an electric motor is, the former converts mechanical energy into electrical energy, the latter transforms the electrical energy back into mechanical energy.

BY foot-pound is meant the equivalent of lifting one pound a height of one foot in one minute. Thus a stamp weighing 1,000 lb. dropped six inches 100 times in one minute develops 50,000 foot pounds.

THERE are usually one of three causes for the foaming of steam boilers—the presence of sodium salts in the water, or of mud or other suspended matter, or else organic matter of some kind may be present.

A JUNIOR CROSS-LODE locator may follow his lode through the ground of the original senior location and through the senior vein, but he must turn all ore taken from the intersection over to the senior locator.

WHERE hydraulic sizing boxes cannot be placed between the stamp battery and the concentrators, the pulp should be sized after passing the vanners, and the overflow sent over inclined canvas tables to concentrate the slimes.

IT is usually figured that the highest safe velocity for water in a wooden flume is from seven to eight feet per second. The California practice is to lay flumes on a grade of about ¼ inch per rod, and sometimes two inches per 100 feet.

WHERE several parallel, or nearly parallel veins occur within a quartz mining location the owner of these—if all apex within the boundaries of his claim—has the same extralateral rights on each as upon the original discovery vein.

WHEN mill amalgamating plates have become hard and non-absorbent, they may be annealed and softened by heating. Care must be taken that the heat be uniformly applied or the plate will 'buckle' and present an uneven surface.

GALVANIZED WIRE ropes cannot be safely employed for hoisting or running ropes. The constant bending over sheaves or drums causes the zinc to scale off, leaving the rope in bad condition. Such ropes may be used for guys and similar purposes.

NO person may enter upon a patented placer or other mining claim to locate water, no matter how long the water may have been unused. If the water flows across the claim, a water right may be taken either above or below it, but not on the claim.

A PRESSURE OF WATER of one pound per square in.h is equal to 2.304 ft. head. A pressure at the gauge of 200 lb. indicates a static head of 460.8 ft. To find the pressure of water per square inch at any given depth, multiply the head in feet by 0.434.

URANIUM OXIDE was discovered in 1884 near Crown hill, about five miles southwest of Lead, in South Dakota. Previous to this, uranium mica was discovered in the Ross-Hannibal mine, in Ruby Basin. This mine produced a high-grade gold-silver ore.

NARROW mortars have a tendency to scour the inside plates of a mill. This may be prevented by covering the place with a heavy wire screen of ½-in. mesh. In a few mills plates of iron cast in the form of a grating have been used to prevent scouring, with good effect.

A STEEL CABLE of 1½ in. diameter, traveling at a speed of 1,056 ft. per minute, will transmit about 2,000 h.p. In comparison with this, an electric current of 10,000 volts at 1,000 amperes, delivered through a copper wire of one square inch section, will deliver about 13,000 horsepower.

ONE TEST for the presence of tellurium in ore is by means of sulphuric acid, which produces a violet color. Pulverize a small quantity of the mineral, place in a white dish and moisten with a few drops of sulphuric acid. If tellurium in any form be present, the violet color will be seen.

THE effect of the presence of small quantities of aluminum in iron and steel was recognized more than 50 years ago. The aluminum renders the steel tough. It is said iron made from ores occurring in aluminous rocks is stronger than ores occurring with other rocks—jaspers, sandstone, limestone, etc.

OIL WELLS flow under conditions which may make an artesian flow of water impossible. Most successful oil wells are located at or near the crest of an anticlinal fold. Water only rises to the surface when the source of supply is higher than the mouth of the well. It may be near or many miles distant.

CAPE NOME, ALASKA, is about 150 miles from the Arctic Circle. Since its discovery, the gold hunters have pushed northward until now some mining is done within the Arctic Circle. The gold discoveries on Selawik river and north of that stream are well within the Arctic Circle and about 1,600 miles from the north pole.

THE laws of California or of the United States do not inhibit mining by ground-sluice method, but tailings, resulting from hydraulic operations, and impounde behind dams built for that purpose, cannot be groundsluiced, as such act would be directly contrary to the purpose of the law placing restrictions on hydraulic mining.

TIN has not been so high as at the present time in many years. The price should prove a great stimulus to prospect for tin, but few authentic discoveries in the United States are announced. Among the places where tin is known to exist in this country are: South Carolina, Maine, Missouri, South Dakota, Idaho and southern California.

UNDOUBTEDLY there is a loss of gold by absorption as well as by volatilization in cupelling, but where the work is carefully done this loss is so small as to be negligible in calculations of value. Doubtless a gold lead can be cupelled and re-cupelled until nothing is left of it. Some careful assayers have placed this loss at from one to three parts in one thousand.

GALENA AND SPHALERITE have very different densities—7.586 to 4.046—still these two sulphides are most difficult of separation by ordinary wet concentration devices. The magnetic separator has accomplished a great deal in this direction and has made possible the production of two marketable products from low-grade, complex ores, which were previously worthless.

GOLD occurred in large amount in ankerite at one place in the Rawhide mine in Tuolumne county, Cal. It was the only place known on the Mother Lode where ankerite was rich in gold. The metal usually is found on this lode in quartz or in the silicified amphibolite schist. Gold is also often found associated with quartz and pyrite in the ankerite, but the ore is usually low grade.

METACINNABARITE is essentially the same as cinnabar, differing only in crystallization and color, which is blackish brown, resembling iron ore. It is found in a number of California cinnabar mines. The appearance of native mercury in mines is not looked upon as favorable to deeper mining, as the metal is so often found near the bottom of an ore-shoot. It is supposed to be the result of distillation of the sulphide from natural causes.

WHEN the owner of an unpatented mining claim has performed $500 worth of work on the location, he may at any time thereafter make application for a patent. The required $500 worth of work or improvements may be made as soon after location as the owner may please—within a week if desired—but annual assessment must be kept up until application has been made for patent, the money paid into the Receiver's office and receipt issued therefor.

WHERE large square timbers are not available for headframes, or for other constructive purposes, timbers may be built up by spiking boards or plank together. Such a built-up timber is no stronger than one of solid timber, provided the latter be sound, but will be found to answer every purpose. If the built-up timber is to be framed before putting in place, care must be taken that no nails or spikes are driven where mortises are to be cut or other framing work done.

WHERE oil is used as fuel in reverberatory furnaces, the steam employed in the blast should be generated by utilization of the waste heat from the furnace. It seems unnecessary to fire up a separate boiler for this purpose except to get the fires started in the furnace. To light the oil from the burner a safe way is to set fire to a handful of oil-saturated waste and hold it under the burner until the latter becomes thoroughly heated, sufficiently to vaporize the oil fed through it.

THERE are no extra-lateral rights in the Leadville, Colo., district, owing to the fact that no jury ever impaneled in the many mining suits in the courts there ever admitted that the deposits had an apex. Were the law literally interpreted in that district, a few outcrop companies could control large areas, their right to follow the orebody being terminated by one of the several faults. Some of the orebodies do not come within several hundred feet of the surface at any place.

GALENA is nearly twice as heavy as pyrite. The former requires 4.34 cu. ft. to make one ton, and the latter 6.41 cu. ft. Vein quartz in place is generally figured at 13 ft. per ton, but it is often somewhat more. Where considerable dark bi-silicate mineral is present, such as hornblende or biotite mica, the specific gravity is higher and as little as 11 ft. is required to make a ton. The mass required to weigh one ton also depends upon the quantity of sulphide minerals present.

ONE of the noted fly-wheels of the world is that at the works of the Mauesman Company in Germany. This wheel consists of a cast-iron hub, to which is attached two circular steel plates. About 70 tons of No. 5 steel wire were used in wrapping the hub of this wheel, the wire filling the space between the two steel plates. This wheel is run at 240 r. p. m., or a peripheral speed of over 15,000 ft. per minute—about 10,000 ft. faster than it would be safe to run a cast-iron wheel of the same diameter.

REDWOOD is a good mine timber where too great weight is not placed upon it. It is more durable than any of the pine timbers used in mines, but can resist much less crushing force, and is very brittle. On the Pacific coast the so-called Oregon pine is superior to most other woods for mining purposes. The life of mine timbers depends largely upon the conditions under which it is placed. Comparatively poor timber will last longer under favorable conditions than the best timber, where set in a moist atmosphere laden with noxious gases.

A TABLE prepared for the use of hydraulic miners and others using water for power or other purposes gives the following data: A rectangular flume, three feet wide, running 18 in. deep, will have velocities and capacities as follows: Grade, ⅛ in. to 1 rod; velocity, 2.6 ft. per second; quantity of water per minute, 702 cu. ft. Grade, ¼ in. per rod; velocity, 3.7 ft. per second; capacity, 999 cu. ft. per minute. Grade, ½ in. per rod; velocity, 5.3 ft. per second; capacity, 1,431 cu. ft. per minute. Ditches and flumes should not be run more than three-fourths to seven-eighths full.

NARROW-GAUGE railroads for the purpose of affording greater convenience and economy in mining operations are always commendable and usually successful from a business standpoint. In one instance a narrow-gauge road was built six miles in length at a cost of about $4,000 per mile. It hauled about 400 tons of ore daily from the mine to the mill, at a cost of 12c. per ton (as against wagon haul of $1.50), and all the supplies, timber, etc., were hauled from the mill to the mine. The mill was situated near a main line of railroad. The difference in elevation was about 600 ft. The plant was situated on the desert and water had to be pumped for milling. It might have been as economical to pump the water to the mine, dispensing with the railroad, as it had to be pumped anyhow, but had this been done, then all the fuel for steam making, timber for mine use, and supplies of all kinds must have been freighted by wagon to the mine, which would have added greatly to the expense of operations. The railroad paid for itself many times over before the mines were closed down.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A USEFUL FORMULA.

The Editor:

Sir—The following formula may prove useful to some of your readers; I have found it so in professional practice:

Development of formula to determine capitalization or true worth of mine having a given yearly net profit; the mine to pay a certain amount each year on capital invested and to pay back in addition, at end of its life, the whole of the capital invested; the sinking fund to be invested at a certain rate during the life of the mine:

Let x = Capitalization.
a = Amount of an annuity of $1 in any number of years. See tables.
y = Yearly sinking fund. Then:
x ÷ a = y, or x = ay. (1)
Let d = Total yearly profits.
z = Amount to be used as dividends. Then:
d — y = z, or y = d — z. (2)
Let c = Rate of interest required on capital invested. Then:
xc = z. (3)

Substituting formula (1), y = d—z in (3),
we have x = a (d—z) = ad—az;
substituting z = xc, we have x = ad—axc, whence
x = ad ÷ ac + 1.

Hence the above formula gives the present value (x) of a mine paying a total yearly profit of d, money to be returned in n years, sinking fund to be invested at m%, and allowing an additional c% as dividends.

Example:

Let the mine pay a yearly profit of $1,800,000 = d.

Let the sinking fund be invested at 5% and the life of the mine be 10 years.

Then from the table it is seen that a = 12.57.

In addition to the sinking fund the mine is to pay 10% on the capital invested; c = 10%.

Then: $$x = a\,d \div ac + 1 = \frac{12.57 \times 1{,}800{,}000}{(12.57 \times 10\%) + 1}$$

Whence x = $10,002,000.

So if the mine be capitalized at $10,024,800, it must pay 10% on investment as dividends, or $1,002,480, leaving the difference between total profit ($1,800,000) and dividends ($1,000,240), available for a sinking fund, namely $799,760. This sinking fund if invested for 10 years at 5% will amount to $10,052,983, or the amount of the original investment.

ANNUITY TABLE FROM KEMPE'S HANDBOOK.

(Showing amount of annuity of $1 = a.)

Years.	3%.	3½%.	4%.	4½%.	5%.	6%.
10	11.46	11.73	12.00	12.29	12.57	13.18
11	12.80	13.14	13.49	13.84	14.21	14.97
12	14.19	14.60	15.03	15.46	15.92	16.87
13	15.61	16.11	16.63	17.16	17.71	18.88
14	17.08	17.67	18.29	18.93	19.60	21.01
15	18.59	19.29	20.03	20.78	21.58	23.27
16	20.15	20.97	21.82	22.72	23.66	25.67
17	21.76	22.70	23.70	24.74	25.84	28.21
18	23.41	24.49	25.65	26.86	28.13	30.91
19	25.11	26.35	27.67	29.06	30.53	33.76
20	26.87	28.27	29.78	31.37	33.06	36.79
21	28.67	30.36	31.97	33.78	35.75	39.99
22	30.53	32.32	34.25	36.30	38.51	43.39
23	32.45	34.46	30.62	38.94	41.43	46.99
24	34.42	36.67	39.08	41.69	44.50	50.81
25	36.46	38.95	41.65	44.56	47.73	54.86
26	38.55	41.31	45.31	47.57	51.11	59.16
27	40.70	43.76	47.08	50.71	54.67	63.71
28	42.93	46.29	49.97	53.99	58.40	68.53
29	45.21	48.91	52.17	57.42	62.32	73.63
30	47.57	51.62	56.18	61.00	63.43	79.06

N. B. KNOX.

Tokyo, Japan, December 18, 1905.

ORE DEPOSITION AND DEEP MINING.

The Editor:

Sir—I have read with very much interest Mr. Lindgren's article on this subject in your imprint of January 20, and since my arrival in California have also read with great pleasure and profit, Mr. Lindgren's official reports in the publication of the United States Geological Survey, also his valuable contributions to the American Institute of Mining Engineers. Unfortunately, I missed meeting him during his visit to Australia when he was looking into the Victorian 'deep leads' of the Moolort Valley as at that time I was making a geological survey of some tin mining areas in northern Queensland. However, we may meet later on this side. In the meantime I would be glad to know from Mr. Lindgren, who the Australian geologists are, whose estimates of the amount of rock removed by erosion he considers too large, and what are the data upon which he bases his estimate of the lesser amount; and if he has been able to fix the period when the gold was formed in the Bendigo saddle reefs, or those of the adjacent auriferous matrices. Having had charge of the underground surveys in this important field, after Mr. E. J. Dunn, the present Director of the Geological Survey had obtained the material for his lucid monograph on Bendigo, I am naturally interested in the question raised by Mr. Lindgren's remark. Again, referring to the Ballarat field, it is stated that "they have scarcely attained a depth of 2,000 ft." At the time I left Australia in May last year several of the mines were down to a depth of 2,300 ft. Regarding the future of deep mining in California, so far as I can judge from the geological conditions at several of the areas, I have visited such as the Johnnie mines in Nevada, the Bighorn in the Sierra Madre, and the Mother Lode, near Placerville, there is every possibility of ore deposition to as great a depth as mining operations can reach, and I can, therefore, heartily support Mr. Lindgren when he says that "the latest results in the State of California and also Nevada offer much encouragement to those who believe in deep mining," in the United States as well as in Australia.

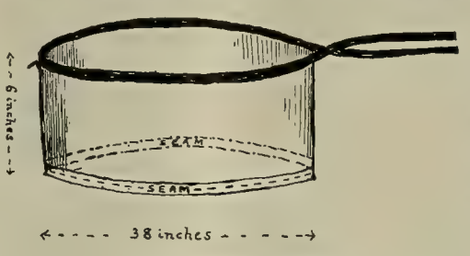
JAMES STIRLING.

Los Angeles, February 4, 1906.

MINE SAMPLING.

The Editor:

Sir—Contributors to *The Engineering and Mining Journal* have described several devices to catch samples as they are broken from the vein. While these devices possess merit, there are obvious limitations to their usefulness. The flexible Mexican hat used



Device for Catching Sample.

by some in sampling, suggested another form which our firm has used, under widely varying conditions, with much success. The apparatus consists of a closely woven, shallow, canvas bucket, with a frame and handle of insulated copper wire. Dimensions are given in accompanying sketch. The wire must admit of the frame and handle being moulded to any desired form in the hands and yet retain its shape during use. No. 2 B. & S. gauge triple-tape, rubber-insulated copper wire would seem to be the most suitable, but, on account of the insulation and temper varying, it is important to test the stiffness of the wire.

Seams can be made nearly as tight as the meshes of the canvas, if sewn with fine linen thread. As such a device can properly be used merely to catch the sample, it is purposely made shallow and should be emptied frequently. This is essential in sampling a friable deposit where material not wanted in the sampling may be broken and must surely be rejected or the results vitiated.

A simple brushing suffices to clean the bucket preparatory to taking a new sample with ore of low or medium grade. In case of friable high-grade ore, additional precautions may be necessary, or possibly a change in the materials used.

When sampling high quartzite stopes in the Black Hills, the handle was lengthened by wiring on a piece of wood. Double-hand work was necessary there, and this enabled the engineer to follow the point of the gad without difficulty.

In sampling a friable irregular vein in Arizona, the device proved invaluable in tight corners. Under all circumstances it is much superior to the classic caudle-box, so often used by the engineer in the past. The canvas bucket is light and takes up but little room. A number can be thrown into the sample-bag when starting on a trip, to be at hand when needed.

Progress is reported in the methods of breaking samples. Mr. H. C. Hoover tells me of a special air-drill which is used by his samplers in Western Australia. For mines using air-hammer rock-drills a few lengths of hose go far to render more complete the triumph of brains over brawn.

HOWARD D. SMITH.

San Francisco, January 30, 1906.

SCREENS.

The Editor:

Sir—My attention has been called to a paragraph under 'Concentrates' in your issue of January 27, in which it is stated that "wire-cloth screens present a greater aggregate discharge aperture than perforated or slotted metal screens of equal opening." This statement should be qualified. To possess durability approaching that of the best perforated steel, wire-cloth must be woven of heavy-grade steel wire, as only this is suited for mining purposes; up to 30 or 35-mesh, slotted screens are made giving areas of actual opening as great as wire-cloth, and in one case where a comparative test was made the close-spaced slotted screen lasted 26 days where the wire-cloth lasted 12 days, under similar conditions in the same mill and treating the same ore.

Finer than the 35-mesh the wire-cloth has greater close-spacing per square inch than is commonly punched in steel, but even in these cases the steel is so much more durable that, where it furnishes adequate capacity, it is preferred.

Another point developed by testing screens—and which may interest millmen—is that of two slotted screens, one with bridge or solid metal between the slots half the width of the other (giving greater capacity), the life will be about the same. The practical reason is that the steel is worn by the particles that strike the solid, not by those that go through the holes, and the screen is only discarded when the mesh or width of hole is worn to exceed a certain limit. This happens just as soon with the wide-spaced as with the close-spaced slots.

There are many other points developed in the screening of materials, some favorable to wire, some favorable to perforations, and whichever is used there is some art in selecting the opening to give the product desired, but as I ought not to tax your space with a book about it I will stop here.

CHARLES H. FITCH.

Oak Park, Illinois, January 31, 1906.

SECTIONAL DREDGING MACHINERY.

The Editor:

SIR—As regards sectionalizing placer dredging machinery for use in remote regions: it is obvious that the boilers, engines and such parts as have been sectionalized for other purposes may be readily obtained in shape for mule-back transportation. There are, however, various portions of the machine which it seems at present could not be sectionalized satisfactorily to the required weight or size of piece which may be transported in this manner.

The standard type of dredge used in California uses a bucket having a capacity of 5 cu. ft.; it has a cast-steel back weighing from 850 to 1,000 lb. Bucket-backs of lighter weight have been discarded in favor of the heavier, on account of the increased wear obtainable. It is true that a built-up bucket either of the continuous or open-link type can be built of small pieces riveted together, but actual practice demonstrates that the solid cast-steel back is preferable in every respect. It is true we are using in California some dredges with 3-cu. ft. buckets, those of the open-link type with built-up buckets having an actual capacity of from 600 to 750 cu. yd. per day, while the continuous-bucket type with cast-steel bucket-back will average from 1,000 to 1,500 cu. yd. per day, in the average digging, without trouble. The upper tumbler for driving the bucket-chain it would be practically impossible to sectionalize; in fact, the latest practice in this respect calls for a six-sided tumbler, in place of the old five-sided, not because six sides are better for driving or for the dumping of the bucket, the fact being to the contrary, but because practice has established a size of shaft which it is practically impossible to pass through the old type of five-sided tumbler. The shafts are getting heavier annually. From my personal experience, dating back to 1893, I can say, that at that time we considered a 6½ to 7-in. shaft as ample for driving a 5-cu. ft. bucket-chain into the tightest of soil. Recent construction calls for hollow-forged and oil-tempered nickel-steel shafts, the very finest that can be produced, of a diameter ranging from 11½ to 14 in.; and as these shafts are from 8 to 10 ft. long, according to the type of drive used, the piece is necessarily very heavy, and there seems to be no possible way to reduce its weight for packing over a mountain trail. In fact, one five-foot dredge, to my knowledge, was fitted with a hollow-steel shaft 18½ in. diam., and approximately 11 ft. long, which it would have been impossible to have made in more than one piece. Other various portions of the dredge could probably be sectionalized to quite an extent, and in the case of remote operations a dredge could undoubtedly be built which would handle a reasonable quantity of gravel and not have any parts too heavy for mule-back transportation. A dredge which closely approximates the necessary conditions for this purpose was built by Mr. Ogilvie, of Dawson, from designs of A. Wells Robinson, of Montreal, and was put in operation on the Stewart river. Buckets were of 2¼ cu. ft. on alternate links of the chain, and the dredge was intended for excavation not to exceed 15 ft. below water-line. The dredge has been successfully used in prospecting various portions of the Stewart river, and now lies on the Yukon a short distance below Dawson. It will probably be used next season for prospecting other parts. The fact still remains, however, that if one has sufficient acreage of placer ground which is suitable for dredging purposes, and which is remote from the common carriers, if the ground is sufficiently rich to warrant his dredging it for a profit, the cost of constructing a road which would permit his machinery to be hauled to the ground in the usual form would be so small in proportion to the profits on the operation that distance from transportation need not deter anyone from entering into the dredge business. I have certain knowledge of machines of the usual type

which have been hauled over mountain trails 70 to 150 miles from a railroad station, and in cases where the owner was obliged to make the road or trail over which the machinery was hauled, and in one case even to send to the Eastern States for wagons, harness, etc., and to Kansas for mules, in order to get his machinery on the ground, and the dredge has repaid its entire cost of installation, and all expenses connected with purchasing the ground, prospecting it and maintaining it, and a profit besides of over 150% on the total capitalization of the venture, although it has only been in operation three years. The prospecting shows an average value of 16c. per cubic yard. This dredge is driven by steam and burns the poorest quality of spruce wood for fuel at a cost of nearly $4 per cord at the dredge, and the dredge consumes 15 cords per day.

G. L. HOLMES.

San Francisco, February 8, 1906.

ELECTRICITY VS. COMPRESSED AIR FOR MINE OPERATION.

The Editor:

Sir—The recent discussion in these columns regarding the relative merits of compressed air and electricity as a method of power transmission in mining work has, I believe, created considerable comment, and in particular the letter of Mr. Edward F. Schaefer in your issue of January 20. In justice to those of us who are vitally interested in the introduction of electrical machinery into this field, as well as to call attention to some inaccuracies in Mr. Schaefer's letter, which unfortunately give the impression that the writer is perhaps not as familiar with modern electrical machinery as he is with compressed air, I beg the privilege of your attention.

In Mr. Schaefer's fifth paragraph he estimates all losses "beginning with a steam engine," thus entirely ignoring one of the chief benefits to be derived from the use of electricity, namely, the utilization of any available water-power within a radius of ten to twenty miles for small plants, and within greater limits in proportion to the size of installation. Further, it is by no means necessary to use step-up transformers at the generating end of a transmission line, as dynamos are now commercially built to generate at voltages as high as 11,000, which is a good deal higher than that necessary to transmit power in moderate quantities over considerable distances; moreover, recent quotations on electrical machinery, both motors and generators, show a decided difference in favor of the alternating current.

I am willing to admit that, generating from steam, compressed air may be produced at a lower installation cost per unit than electricity, but this advantage I believe to be far more than offset by the gains made possible by the extreme flexibility of the electric system. Compressed air is practically essential in modern mining operations for one reason only, namely, the operation of rock-drills, in which field it still predominates and probably will for some time to come, although there are many designers now working on the problem of the electric drill, some of whom have produced fairly practical machines—and, to my mind, it is only a question of time until the air-machine is superseded in this work, as it has been in practically all others. In the coal mines of the Eastern part of the country electric power now does everything excepting this one operation; having gradually pushed out the compressed-air coal-cutting machines, hoists and locomotives, and in this State it will be found that it is used more or less in every new undertaking of any magnitude.

Another point, which Mr. Schaefer has ignored, is the extreme ease and efficiency with which electric pumps and hoists may be installed. This point is of extreme importance in the operation of winzes, often situated at a considerable distance from the power-house, where the use of air or steam would be impracticable, if not impossible. The ventilation advantage is about evenly balanced, though I have known cases of bad air in stopes where hand-work only was being done, having been quickly relieved by the installation of a small electric blower, which would be obviously impracticable with any other power.

So far as danger is concerned where bare conductors—such as trolley wires—are used, I would say that, for reasons of insulation, a voltage higher than 250 is seldom used, a shock from which, while unpleasant, is by no means dangerous under ordinary circumstances. The most ignorant workman, after one experience, learns to leave it alone, and I have never heard of a serious accident chargeable to this cause.

Momentary interruption to the service is liable to occur, but the complete modern electrical installation is usually provided with duplicate parts to such an extent that service may be continued, wholly or in part, with very slight loss of time, while the bursting of an air-line or the breakdown of a compressor invariably means quite a long shut-down.

Regarding the lighting question, there is a decided difference of opinion, but it is undoubtedly a fact that whether lights are used or not at the working faces, lights at the shaft or in the tunnel are of the greatest advantage, both for considerations of safety and convenience. I take serious exception to Mr. Schaefer's statement that the "old form of miner's lamp has the advantage." I have never yet seen or heard of any kind of a lamp with which "explosions were impossible," and I believe that the electric light comes nearer this point of perfection than any other now in use.

The marvellous extension of the use of electricity in other fields will have its parallel in the mining world, and I await only the perfection, in the near future, of the electric rock-drill to see it become the one power used, or thought of, wherever mining work is done.

HAROLD B. BARNES.

Leadville, February 6, 1906.

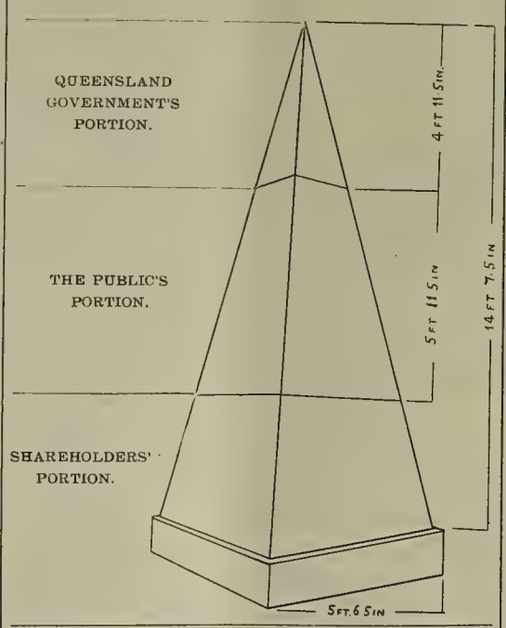
FINE GRINDING.

The Editor:

Sir—As one whose experience in ore grinding began 36 years ago and who subsequently has been almost uninterruptedly associated with it, I am pleased that interest seems to be taken in the public discussion of the subject. It is to be hoped that a generous spirit will prevail and no bitterness engendered.

With some ores, values are pretty well released without very fine comminution, but I believe that we of the United States have generally erred in not making our pulp fine enough. Our *patio* neighbors to the south of us have always in the past excelled our work in that respect. They have been content with their slow-going *arrastres* and unmodernized Chilean mills, in which the coarser particles settle to the effective-crushing zone while the finer particles float above.

We early evolved the pan, with a faster motion, to grind as well as to amalgamate, but in this there is



Pyramid Representing Gold Produced by Mt. Morgan Mine.

no systematic selection of the particles most needed to pass the grinding surfaces. The pan served the purpose when we knew no better, and strange to say it still, by some, seems to be considered an economical grinder. More than 20 years ago I departed from this practice by introducing special grinding pans in which the pulp passed once under a muller having a solid ring disc and thence out of the pan to another of the same kind, if finer pulp was desired. These were decidedly better and more economical than the amalgamating pan, used as a grinder; yet they were not as efficient and desirable as a grinder adopted some 16 years ago which was of the old buhr-stone flour-mill type, made entirely of metal, and run at a high speed. Where the bottom disc revolves instead of the upper, the sand particles rotate better between the two discs at the period of crushing, and so cut the metal to a less extent, and also the crushed particles pass more quickly away. Undoubtedly no method of grinding between two parallel surfaces of metal can surpass this simple and almost primitive device, and cost of it is probably less than that of any other machine of like capacity. Yet all grinding between parallel surfaces unavoidably involves considerable loss of shoe and die metal.

Power is consumed by that as well as any other means of making a hard ore very fine. When one considers the square surface area of cleavage involved in breaking a ton of ore to pass a 200-mesh screen, the power involved, without allowing for loss in its mechanical attainment, appears formidable in ratio with the hardness and toughness of the ore in hand. If a solid cube of rock weighing one ton is cut into cubes measuring $\frac{1}{100}$ of one inch, it involves a cleavage of approximately 15,600 square feet; yet if a sample could be had solely of such small cubes, it would appear as fine sand and not as slime. It is quite probable that a pulp that has passed a 200-mesh screen would more nearly represent three or four times the afore-mentioned area of cleavage.

It is not possible, at least commercially, to obtain as fine a product from grinding between two parallel surfaces of metal as that produced by a tube-mill, still it is not yet safe to say that there are no situations wherein the grinder is more advantageous than the tube-mill, and this without reflection upon the success of the latter.

The commercial profit line is affected by characteristics of environment as well as characteristics of an ore, and in one locality it might be profitable to grind an ore finer than the same ore in another locality, so that every individual case must be determined apart. Data of costs and conditions bearing upon other ores when treated by different means, are an assistance in forming a decision as to what course to pursue in any given case; but decision must be made by individual judgment and not by fixed rule.

M. P. BOSS.

San Francisco, Feb. 12, 1906.

Distributing the Profits.

The accompanying diagram represents a pyramid of gold 14 ft. 7½ in. high, with a base 5 ft. 6½ in. wide, this being the amount of gold won from the Mount Morgan mine (in Queensland, Australia), from July, 1886, to May, 1904. The gold weighed 2,623,734 oz., valued at £11,150,870 or $54,081,720. Of this total, the Queensland government's portion was £429,432 or $2,082,745, the public's portion was £4,309,104 or $20,899,154, and the shareholders got £6,412,334 or $31,099,819.

The details are given herewith:

QUEENSLAND GOVERNMENT'S SHARE, £429,432.

PAID TO QUEENSLAND GOVERNMENT.

	£
Dividend duty	207,708
Royalty	65,842
Railage	74,563
Railway sidings	8,425
Customs' duties, direct	31,116
Customs' duties, indirect	25,821
Telegrams, cables, and postage	8,513
Leases and Miners' Rights	4,103
Stamp duty on insurance policies	2,380
Cheque books	931
	£429,432

PUBLIC'S SHARE, £4,309,104.

VARIOUS EXPENDITURE.

Materials produced in Queensland—Billet wood, charcoal, manganese, coal and coke, timber, horse feed, general stores, machinery, etc.	675,089
Other Queensland expenditure	237,168
Wages, salaries, and contracts	2,650,016
Stores, etc., imported (purchased in Australian and foreign markets)	746,831

SHAREHOLDERS' SHARE, £6,412,334.

Dividend and balance in hand	6,412,334
Grand total	£11,150,870

From May, 1904, to May, 1905, the government received £34,267 or $166,195; the public, £376,010 or $1,823,648; and the shareholders, £168,771 or $819 039; the total output being £579,048 or $2,808,882. Therefore the total production of the mine in 19 years has amounted to $56,891,602 and out of this the profits earned have been no less than $31,918,858, or 56%. This is a splendid record.

MAGNESITE DEPOSITS OF CALIFORNIA.—The market for native magnesite may be influenced in future by the fact that a factory for the manufacture of magnesite brick has recently been erected in East Oakland. It is as a material for making refractory brick for lining cement kilns and smelting furnaces which carry basic slags that magnesite finds its most important use. The magnesite brick made in this country has, up to the present time, been manufactured in Pennsylvania out of magnesite imported from Greece or from Austria, which has been cheaper than magnesite brought across the country to the steel furnaces from California. It remains to be seen if the manufacturers of steel in Pennsylvania will not find it cheaper now to transport the California brick than to buy brick made in Pennsylvania from imported magnesite. Nearly all the magnesite known in the United States is found in a belt of serpentine that extends from southern California along the coast range to Oregon. In the northeastern part of Santa Clara county, 32 miles southeast of Livermore, there is a deposit on the exploitation of which a large amount of money has been spent. Several big veins have been opened, and development has been proceeding by open cuts and tunnels. The magnesite is transported a half mile over an aerial tramway to bunkers and thence by traction engines and iron wagons to Livermore. Near Portersville, in Tulare county, about 275 miles southeast of San Francisco, lies a second magnesite deposit. These mines, which are worked by tunnels and open-cuts in veins, are operated by the Willamette Pulp & Paper Company of San Francisco. Mr. W. P. Bartlett is superintendent of the works. Nearly all the magnesite produced here is burned at the mines with fuel oil, just as limestone is burned to make lime. The burned residue—magnesia—which is used by paper mills for digesting and whitening wood pulp, is shipped to Oregon City, Oregon. The small portion of magnesite not burned is used in its raw state by the Western Carbonic Acid Gas Company of San Francisco, for the manufacture of liquid carbonic acid gas in its plant at Sedan. At Chiles Valley, in Napa county, there are old magnesite deposits which were worked for about 12 years.—*U. S. Geological Survey.*

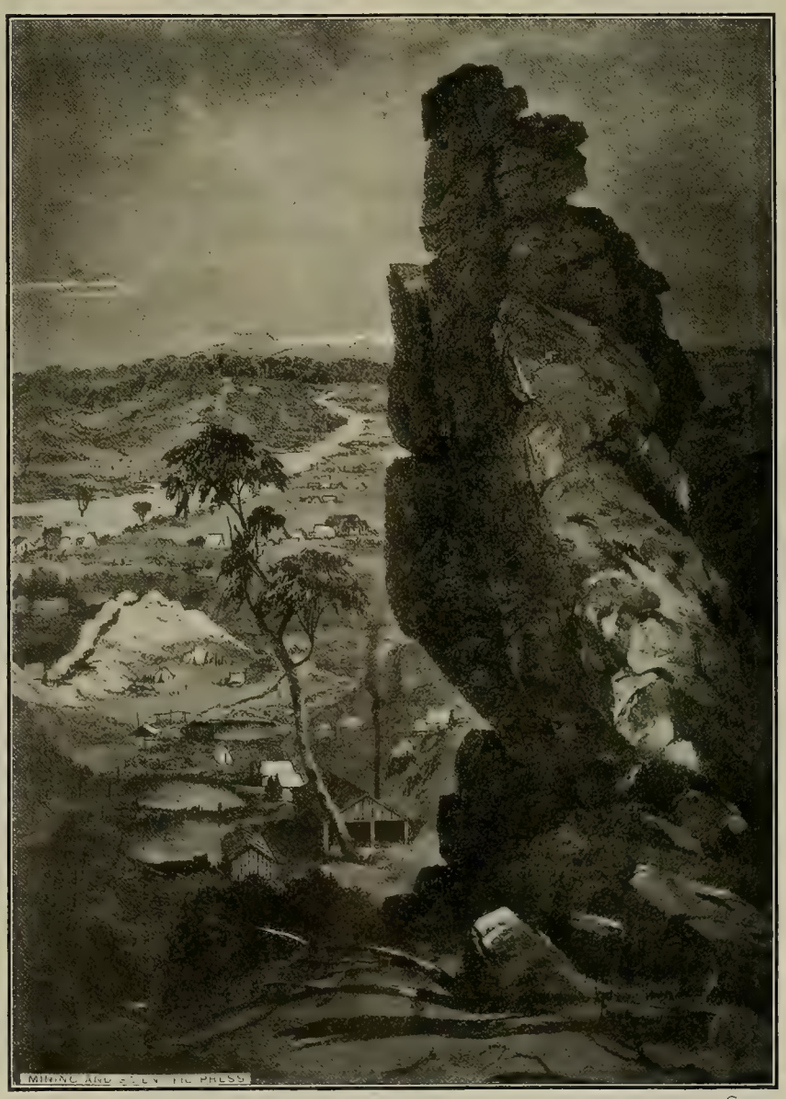
Gold Mining at 4,000 Feet.

Deep sinking is a problem which Bendigo mining investors have been endeavoring to solve for a number of years past. George Lansell was the first to grapple with it. He offered a bonus to the company which would first reach a depth of 3,000 ft. with its shaft; but he did not have to make any award, for he got down there first with his No. 180 mine. In those days even the miners spoke somewhat with awe of the prospect of working at a depth of 3,000 ft.; now, with work proceeding below 4,000 ft. in the New Chum Railway and the Victoria Quartz Reef mines, no appeal is made to the imagination. It has been left to the New Chum Railway, seconded by the Victoria Quartz, to pioneer the deep ground. It was fitting that this should be done by a mine which was the producer of the deepest rich reef worked up to the present; that reef was cut at about 3,000 ft., and it yielded £98,000 in dividends. Since then the manager has sunk through another 1,000 ft. of practically barren country. Buoyed up by the manager, C. S. Rowe, who holds a large interest in the property, the shareholders have at no period lost heart in the venture. Of all the difficulties to be faced heat was the worst. The shaft was deepened from 3,200 ft. to 3,856 ft. without serious trouble, but the extension of the crosscut east at that depth was a laborious task; it traversed for the greater part the hardest kind of sandstone, and the heat was such that a spray had to be kept playing on the men as they worked in the face, stripped to the waist. At the plat, near the shaft, a shower-bath cooled the heated bodies of the truckers. When the crosscut had passed through the anticline without result, the sinking of a winze in center country was decided upon. But first of all more air was wanted. So a raise was put up from the crosscut to connect with a winze sunk from 3,200 ft. It was so hot in that raise that the management decided to experiment with ice, in the hope of cooling the workings. Several hundred pounds were placed over the crosscut, but it melted too quickly to appreciably lessen the appalling heat thrown off by the rock. The spray was the men's comfort. Without it the raise would never have connected with the winze. Then the winze below the 3,856-ft. crosscut was started. For 18 months it has been in progress, and now it is down about 374 ft. below the crosscut, making the total depth of the workings 4,230 ft. At a depth of 4,165 ft., or when the winze was 309 ft. below the crosscut, the first discovery of quartz was made. It proved to be the top of a formation, and as the winze was deepened it opened up the western fringe of the reef. Fair prospects of gold were occasionally seen, but the west leg did not turn out as well as it had promised. It was with the object of proving the eastern portion of the reef, or the east leg, that a crosscut was started from the winze at 4,226 ft., and much gratification was afforded shareholders by the fact that the leg is 4 ft. wide at the point of intersection, and that it is rich in gold. They also had the satisfaction of having struck gold at the deepest point yet known in mining.

The Victoria Quartz has been a close follower of the New Chum Railway, and, judging by recent developments in the winze which is proceeding below the 3,824-ft. crosscut, the enterprise of the shareholders is likely to be rewarded. The bottom of the winze is now 4,110 ft. from the surface, and for about the last 10 ft. it has traversed a network of gold-bearing spurs. The last firing-out disclosed 3 ft. of quartz under a slide, and the indications are that this ore, in which a few fine colors of gold were observed, has connection with the cap of a formation. Whatever may be the reward the shareholders will receive, they deserve the praise of all mining men for their perseverance and pluck. The company paid their last dividend in June, 1900, and the money came from the profits won from a reef worked between 2,606 ft. and 2,704 ft. It is a long way from 2,704 ft. to 4,100 ft. through solid rock, and every foot of it made its impression on the company's finances. But gold gets gold, and the shareholders philosophically paid their calls. The winze was started from the 3,700-ft. crosscut, and only one shift was employed in it, and it has taken the two men who work in the bottom about two years to get to the present depth. Their work has been laborious and trying, but the conditions in the winze, strange though it may at first appear, are pleasant in comparison with those which ruled in the 3,700-ft. crosscut when it was being extended from the shaft. The heat was intense in the crosscut, because there was no connection between it and the upper levels, save through the shaft, and consequently the air could not circulate freely. At the end of that crosscut the heat from a single candle, which wasted away in grease in my hand, appeared like the glow of a coal-fire. I recollected that the flame of the candle was consuming more air than a man, and I extinguished it, and felt that I ought to be able to draw a deeper breath. And ever after I wondered how the two men at the rock-drill could smoke their pipes with evident enjoyment.

Now, however, the 3,700-ft. crosscut is connected with the upper levels, and a get-away is provided for the air after it has reached the bottom of the winze. From the shaft the air-current passes along the 3,824-ft. crosscut down the bucket-compartment of the winze, and, turning under the timber above the heads of the men at work in the bottom, ascends the ladder-compartment, and courses through the workings until it reaches the 3,310-ft. level. From there it finds its way to Mr. Lansell's 180 mine, and through its shaft to the surface. It has filled its mission, and it would offend the lungs of any toiler of the surface. Give the air an inlet and an outlet, and it can be easily trained. Wilfred Rickards, the manager of the Victoria Quartz, knows this, and he has made excellent use of his knowledge. At the plat at the 3,824-ft. crosscut the temperature is only 73°, while at the bottom of the winze it is 84°. Of course, temperatures are much warmer to the system at such depths than they would be in the open air at the surface, but they are by no means unbearable. The figures are much below those recorded in the New Chum Railway, that is, 85° in the 3,856-ft. crosscut, and 90° in the end of the 4,226 ft. crosscut; but it must be remembered that that company's shaft is an upcast, while the Victoria Quartz shaft is a downcast. That is to say, the New Chum Railway gets its air through the Eureka mine, and not direct from the surface, like the Victoria Quartz.

Fears have often been expressed that the great heat will interfere with deep operations; and so it will, if proper measures are not taken to provide good ventilation by letting air course through the workings to take away the heat thrown off by the rocks. Free ventilation means comparative coolness, and the best way to bring that about is by connecting level with level by winzes and raises. In making those connections the worst hardships will be entailed, but a proper study of artificial methods of cooling the workings will render the men's work much less laborious, and save the companies expense. Down at 4,226 ft. a man is not the man of the surface. The weight of air depresses him. He may crack a joke, but it falls flat, and the smile that appears on the listener's face is the illumination of only an instant. As soon as he gets below 3,500 ft. the ear-drums are affected for a few seconds. His companion in the cage seems to be talking under his breath. But the recovery of hearing is as quick as that of eyesight after groping for several minutes about a dimly-lighted plat. An ascent in a cage of nearly 4,000 ft. in a downcast shaft is a ride as breezy as a motor-car could provide, and as the surface is neared one's teeth chatter. Perhaps the sunlight on top is a little dazzling at first, but there is no mistake about the beauty of the blue sky, even to eyes that have seen gold under its most fascinating conditions, set in white quartz, side by side with silvery galena and mundic, and revealed from the gloom of the world's deepest gold mine by the glimmer of a candle. One thing those who go deep down can ever after appreciate, and that is a hilltop in a fresh breeze. — From *The Argus*, Melbourne.

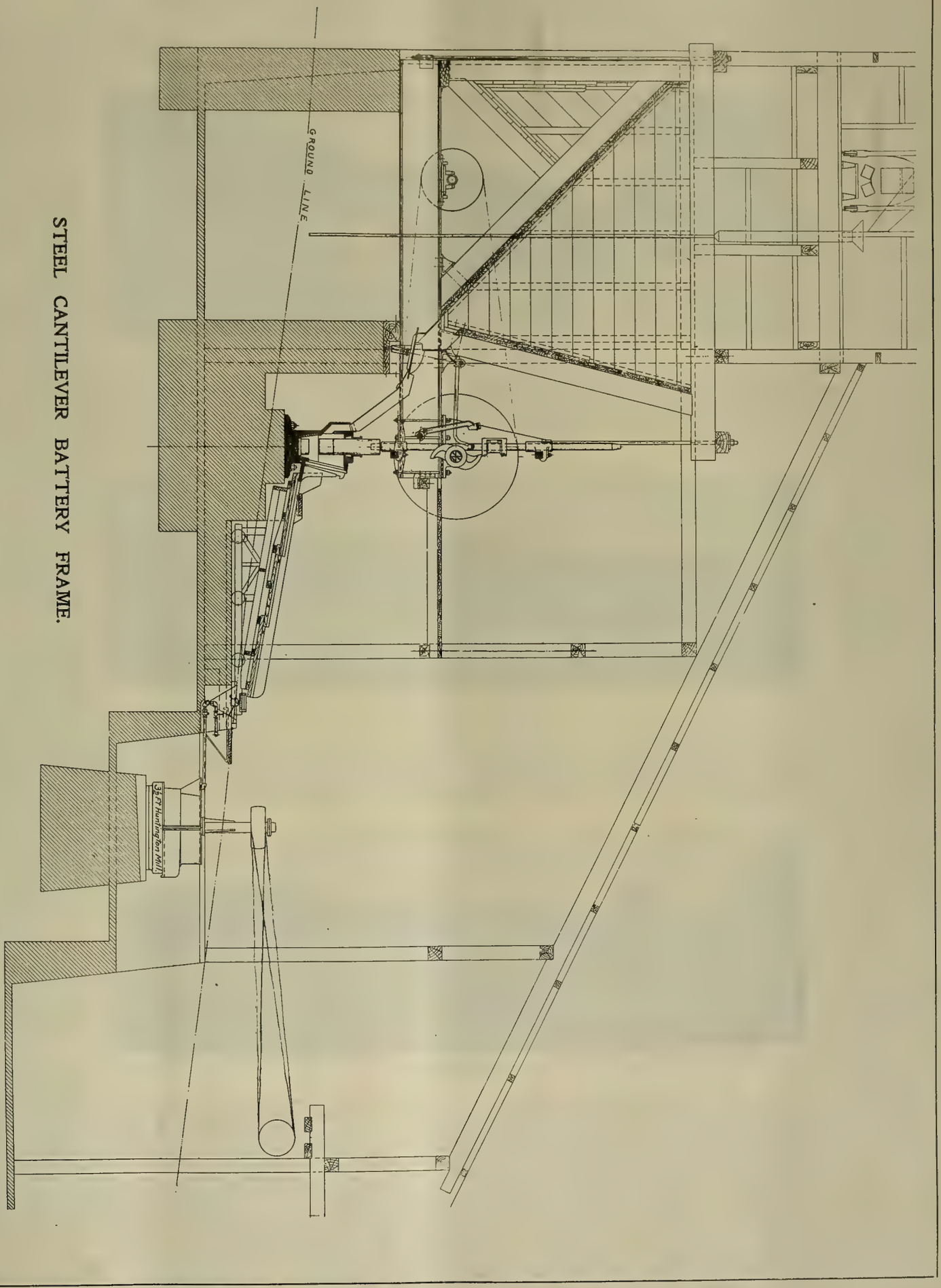


Bendigo in 1851, Illustrating the Outcrop of the Leg of a Saddle-Reef.

Cantilever Stamp Battery.

On the opposite page we publish a drawing of this interesting departure in stamp-mill design. The distinguishing features are the absence of wood in the construction, and the wide clearance around the mortar. The mortar is easily accessible and the stamps are readily hung up by means of latch-fingers operated by levers placed in front. The boss-heads are large and project from the top of a shallow mortar; this arrangement permits of placing the guide close to the stamp and reduces the breakage of stems to a minimum. The cantilever steel battery-frame is the invention of that veteran mill-constructor, Mr. M. P. Boss, of San Francisco. The first battery of this type was installed at the Midway mine, Tonopah, and another was built for the Combination Mines Company, at Goldfield. At the latter mill a few minor defects in the first design were corrected and the results have proved most satisfactory. A nine-months' trial was made with two five-stamp batteries. Two additional batteries of the same design are now being erected. In the Combination mill not one stem has been broken in nine months; and there is no record of any such breakage in the Midway mill during a much longer period. The design affords compactness and rigidity; the mortar rests on a block of concrete, with a rubber sheet interposed, and is tied above, by means of heavy rods, to the top of the ore-bins. Vibration is reduced to a minimum. For these data we are indebted to Mr. F. L. Bosqui, who became familiar with the working of the mill while making cyanide tests at Goldfield.

PRODUCTION OF CEMENT.—California a few years ago was one of the great importing States. Vessels from Germany and England, bound for the Pacific Coast for grain cargoes to Europe, usually carried portland cement as ballast, or at extremely low rates of freight, and the western coast of the United States remained one of the largest markets for the European brands of cement. Today California has three works, and one of these is in process of enlargement, so that it will become one of the great producers of the country, and very likely will supply large quantities of cement to Mexico and Panama by reason of its easy access to the sea. With the development of mining and irrigation, cement plants have been constructed both in Utah and Colorado, and their capacity is to be largely increased.—Robt. W. Lesley in *Eng. & Min. Journal*.



STEEL CANTILEVER BATTERY FRAME.

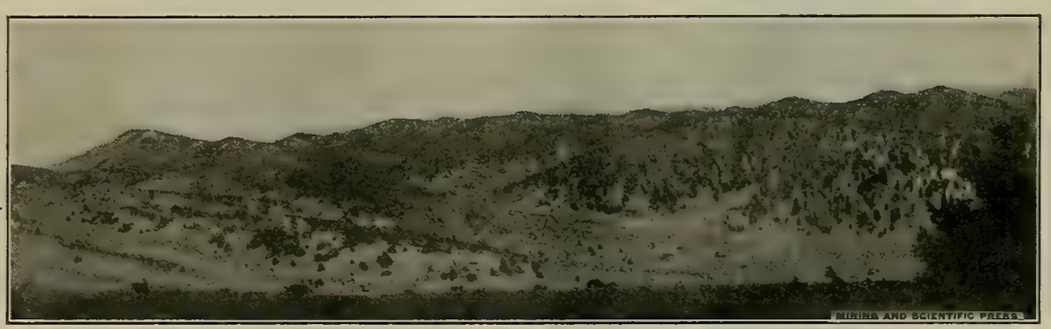
Manhattan.

It is difficult to get accurate information about a new mining camp. As a newly born infant seems to the fond parents to be without question the finest of its species, so a new gold district is to its discoverers and promoters the Colchis of their dreams. Manhattan is producing rich ore and if, as yet, it comes only in sacks and not in carload lots, it is because the stuff is very rich and will pay expensive transport—the only kind available until a branch railroad is extended from Tonopah, a distance of 55 miles; this event is expected in April. A wagon road is being built from Manhattan to Mina on the California & Nevada Railroad.

The town lies in a canyon three miles in length and has but one street, which is nearly a mile long. The rich gold discoveries have been made on both sides of the canyon. The tent lodging-house accommodations are not equal to the demand at present. There are 3,000 men at the new camp and the influx from the surrounding region is likely to continue. About one-half of the inhabitants have come from Goldfield and a thousand from Tonopah; but the distant mining centers are poorly represented. There is evidence of confidencein the future of Manhattan, for merchants are bringing large stocks of goods with them; warehouses, office buildings, saloons and gambling dens are being erected on every block.

Looking Across the Main Street.

Two banks are in operation. The streets are lined with people day and night, and the air vibrates with excitement. Every new strike reported adds to the electricity in the atmosphere. At least 300 lessees are now at work, and many applications for leases are being received by mine owners. On lease No. 14 of Union No. 9 claim, a shaft is down 65 ft. on a 5-ft. vein of rich ore. The lowest assay taken was $90 and the highest $250, while some selected samples of specimen rock go into the thousands. Moreover, the formation, which at the top was decomposed and flaky in appearance, is now a quartz of the Goldfield kind. On the Briggs lease, also on Union No. 9 claim, the lessees are down 50 ft., and they declare that they are taking out ore at the rate of $100 per hour. Returns just received from the Columbia Sampling & Ore Company for two cars of ore shipped from the Hudson lease on the Stray Dog claim show an average of $460 per ton for the entire shipment. This consisted of a talcose spar and was taken so near the surface that decomposed grass-roots could be discerned in the ore. On the April Fool claim of the Seyler-Humphrey Mining Company the lessees are taking out ore from which some big assays have been obtained. Much attention is being attracted to the Black Mammoth and Black Mammoth No. 1 claims, owned by the Manhattan Combination Mining Company, of which L. L. Patrick, organizer of the Combination Mines Company of Goldfield, is president. These two claims lie a few thousand feet south of the Mustang. On them is seen the best defined outcrop in the district. Two shifts have been put to work. On the Iron King and Iron Queen claims, owned by the Manhattan Cowboy Mining Company, 16 lessees are at work. Three of these are already in ore, and one of them is sacking high-grade stuff. One strong, well-defined ledge and a network of cross-veins are opened up on the Mayflower, Stray Dog, Annie Laurie, Union No. 9, Iron King and Iron Queen, Jumping Jack and Reilly Fraction, which form a composite group. Among the principal mines are the Broncho Lease No. 1, the April Fool, the Mustang No. 1, and Leases No. 6 and 8. The Manhattan Gold Mines Company has been organized to operate these leases, as well as the Granite group. Charles F. Kapp, of Manhattan, and Volney T. Hoggatt, of Denver, a brother of Wilford B. Hoggatt, Governor of Alaska, are the principal members of the company. The Iron King and the Iron Queen mines were recently bought and on these claims there are 17 leases. Five of them are shipping ore ranging in value from $2,500 to $3,400 per ton, according to the report of E. E. Stewart. The specimens show free gold in abundance. A large block of shares is said to have been bought by the Guggenheims, of New York, the sale being negotiated by J. J. Mack.



Manhattan, Nevada.—Beginning of Town Seen in Center of Illustration

The new city will soon be lighted with electricity. Mr. Kapp has organized an Electric Lighting Company, with a capital of $1,000,000, bonds to the amount of $200,000 having been issued. Engineers are making the necessary surveys, and the general manager, Karl J. Young, is securing the necessary equipment for this enterprise.

Lessees at Work.

The conflict over the claims of the Manhattan Dexter Mining Co. has been settled in two instances. The courts will have to decide the merits of other issues. The title to Union No. 2 and Union No. 3 claims, which was disputed by Rakestraw & Norton, has been settled by the organization of the Manhattan Union Mining Co. The Manhattan Dexter Mining Co. conceded to this company the Union No. 2 and Union No. 3 claims, and Rakestraw & Norton turned over to it the Turtle Dove and Big Mogul claims, which adjoin the Union No. 2 and 3. The Union No. 9 claim of the Manhattan Dexter Mining Co. is not in conflict. Title to the other 17 claims is contested. The hearing will be before Judge Breen, Feb. 20, in Tonopah, and the merits of the controversy will then be decided.

Some of the best mining talent in the West is at Manhattan and is engaged in examining formations and tracing ledges, with a view to gobbling up, at normal figures, any properties that are likely to carry an extension of the veins in evidence on the Broncho, Mustang, April Fool, Mayflower, Stray Dog, Jumping Jack, Annie Laurie, Iron King and Iron Queen claims.

GOLD MINING IN JAPAN.—At present the chief alluvial mines in Japan are in Hokkaido, the output from Kyushu having fallen off in late years. Not much information is yet available as to the extent and value of the Formosan deposits, but they are of rapidly growing importance. During 1902 the principal alluvial mines in Hokkaido gave the following outputs: Shintotsugawa, 6,616 oz.; Usotannai, 4,074 oz; and Peichan, 2,196 oz. The cheapness of the labor and of the plant required, as well as the skill of the Japanese in washing poor gravel, permit these placers to be worked profitably, but the climate makes it necessary to shut down during winter. The chief apparatus employed in washing the gravel are 'long toms' and 'cradles.' Wooden washing dishes, rectangular in shape, are much used. So far, except on a small and primitive scale, no hydraulicking has been attempted. In Japan proper, the future of placer mining is likely to be but a moderate outlook, even with the introduction of better appliances and more modern methods of washing gravel. Sufficient is not yet known of the Formosan alluvial deposits to allow a trustworthy opinion to be formed of their value. It is in the mining of auriferous deposits, other than placers, that the bulk of the future gold supply of Japan may be looked for. The distribution of the reef gold produced in the different mining districts during 1902 was as follows: Sapporo, 1,120 oz.; Sendai, 5,917 oz.; Tokyo, 19,780 oz.; Osaka, 15,149 oz.; Fukuoka, 26,390 oz.; total, 68,356 oz. Speaking broadly, the deposits in Honshu, with the exception of those at Sado, Ikuno and Innai, though rich in places, are generally small. In Kyushu, and especially in the southern portion called Satsuma, good orebodies occur, usually in the form of large low-grade orebodies, wholly contained in andesitic rock. Several of these are now being worked, though mostly in a primitive manner.

ANTIMONY.—The chief ore of antimony is the sulphide (stibnite, or gray antimony) Sb_2S_3, which when pure carries 71.4% of metallic antimony, or 1,428 lb. to the ton. Another important ore is stibiconite, or antimony ocher, the oxide, Sb_2O_3, which at the maximum contains 74.5%, or 1,490 lb. to the ton. Although antimony minerals occur in many localities in the United States and considerable quantities of stibnite are known in South Dakota, Utah, Nevada and California, the only State reporting production in 1904 was Arkansas, and the quantity from there (12½ tons) was an insignificant fraction of the total amount used in the country.

BENDIGO has produced, from 1851 to 1905, inclusive, no less than 18,200,000 ounces of fine gold, which is equivalent to 560 tons of metal.

Mining Methods—II.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

Several of the most important mines of the Mother Lode are operated through a single shaft, though some have two shafts and others three, but in every case there are hundreds of feet longitudinally along the vein to be developed and stoped from these shafts.

The usual mining practice is to drive a drift (or crosscut if necessary), to the vein from the station at the shaft. This cutting may, or may not, at once encounter ore. In case of no ore being present in the fissure, the drift is continued along the vein in search of the ore-shoot. This drift must be timbered in a most substantial manner, the timbers being seldom less than 24 in. diam. and often larger. The gangway is generally cut 9 to 10 ft. high, 8 to 9 ft. wide at the top, and 10 to 11 ft. wide at the bottom, the posts being given considerable spread. When timbered, the drift is 3½ to 5 ft. wide at the top, 7 ft. high and 7 or 8 ft. wide at the bottom. It has been found advisable to cut these large gangways owing to the peculiar conditions encountered.

The fissure may vary from 3 or 4 ft. to 40 ft. in width, and it may be filled partly or wholly with quartz, the remainder of the space being filled with the gouge, and whether the fissure contains quartz or not, the ground is heavy. As soon as pay-ore is found it is hoisted from the mine and sent to mill, the drift being continued along the vein. Stopes are started and mining proceeds in the usual way. Ordinarily, there would be no objection to mining in this manner, but not infrequently it is several hundred feet to the property line—often 1,000 ft. or more, and seldom less than 100 ft. to the level above—and all of this gangway must be kept open by constantly relieving the timbers, and often re-timbering, which is more expensive than the original work, until this entire level has been explored and all the ore stoped and removed to the surface, for in such ground it cannot be broken and permitted toremain in the stopes until it is convenient to withdraw it, as may be done in mines where the walls are hard. In some of the largest mines several levels at one time are thus worked and maintained in the manner indicated.

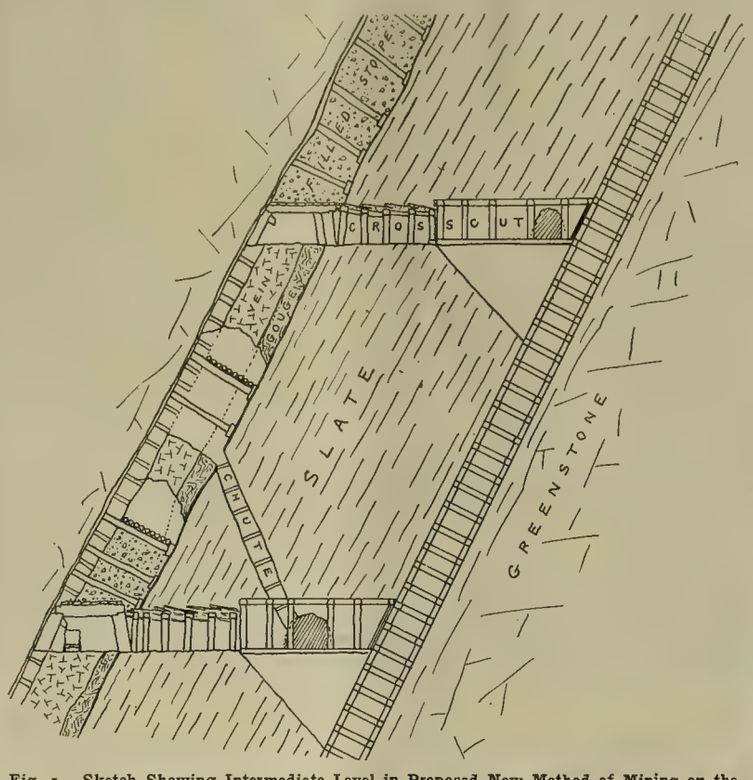


Fig. 1. Sketch Showing Intermediate Level in Proposed New Method of Mining on the Mother Lode.

In consideration of the conditions and consequent expense here obtaining, under present methods, the need of a system which will in some measure obviate the necessity of doing several times over the work already performed, is apparent. The success attending the experiment of sinking main working shafts in the country rock, and of cutting drifts in the hard foot-wall around a bad piece of swelling ground, certainly points the way to an improvement in the system of mining as now practiced on the Mother Lode of California.

As between the advantages offered by vertical and inclined shafts, engineers often disagree, but where the conditions are as found on the Mother Lode, after over 50 years of mining and a development to the depth of half a mile or more, there should be no doubt which is preferable. The fissures of the Lode in Amador county, where most of the mines here discussed are situated, dip at about 63°, and while vertical shafts reach a given depth on the vein in less distance and therefore usually at less expense than inclines sunk in the hard foot-wall country, yet, on the whole, the advantage seems to be in favor of the incline, as the expense saved in sinking the vertical shaft is in most cases more than offset by the cost of driving crosscuts to reach the vein—a matter of no little consequence in the operation of a mine to a depth of 2,000 ft. or more, particularly if levels be established at every 100 feet.

The main gangways should, in my opinion, be cut in the foot-wall at a distance from the vein, which will avoid the heavy, swelling ground adjacent to the fissure. Ordinarily this can be found at 40 to 60 ft. from the vein. Should the shaft be an incline, as here suggested, this crosscut of 40 to 60 ft. would largely be taken up with the station plat and ore-bins beneath, which would be a necessity at either an incline or vertical shaft. From the gangways, crosscuts should be run to the vein at stated intervals—the distance to be determined by the size and character of the vein. Where the ore is wide, the crosscuts should be made at more frequent intervals than where the pay-streak is small, as the time required for the extraction of any particular block of ore is always an important matter in these calculations. The crosscuts may be made at points from 180 to 240 ft. apart, according to the size of the vein. Raises should be put through from each level to that above, and these should be started as soon as stoping commences, or just before that time, and driven as rapidly as possible, in order that the cutting may not be closed by the heavy ground, and if one wall gives less trouble from this cause than the other, the raise should preferably be made on that side. If ventilation be good, it may be well enough to put up the raises as the stope progresses upward, instead of in advance of it. Ordinarily, however, ventilation is none too good, as the air in these stopes is hot, close, and laden with the vapors and foul gases characteristic of mines, and this condition the through connections from level to level help greatly to mitigate.

It is noticed that there is an almost universal tendency to drive stopes longitudinally on the vein faster than they are carried upward; that is, too much ground is kept open at one time. This operates disadvantageously, as a greater length of time is required to extract a block of ore from one level to the next above. If the stope be made shorter, and haste be made in an upward instead of in a horizontal direction, there will be required a less time to keep the ground open. If, as suggested above, the crosscuts be driven at intervals of, say, 240 ft., and the vein opened both ways from this crosscut, the first raises would be put in 15 ft. to the right and left of the crosscut, then beyond each additional raise or mill-hole is located at 30 ft. from center to center. If there be four raises on both sides of the crosscut, these will command 120 ft. of the stope each way from the crosscut. A similar series of raises from the next crosscut will make easily available the entire block of ore between the two crosscuts, and from one level to the next above. If the ore in these stopes be extracted as promptly as possible, there will be little trouble from swelling ground—far less, at any rate, than that experienced under the present method of mining on the lode.

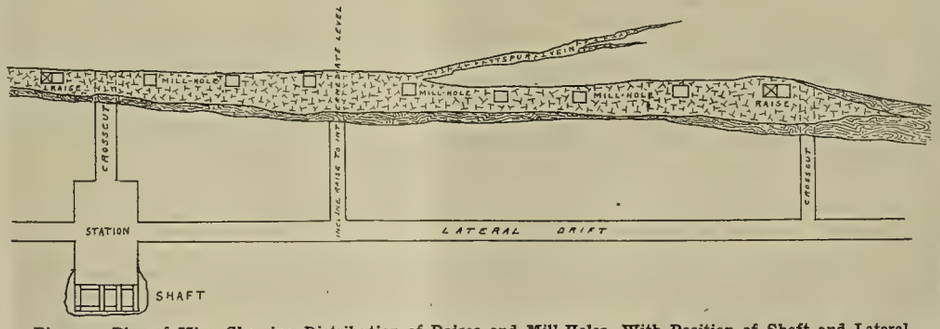


Fig. 2. Plan of Mine Showing Distribution of Raises and Mill-Holes, With Position of Shaft and Lateral Drift, in Relation to Stopes.

The putting up of raises prior to stoping not only facilitates ventilation but affords an easy means of sending timbers down into the stope from the level above, instead of pulling them up from below by means of block and tackle, or in even more crude fashion. In each stope it is not necessary that more than one raise be put through, in advance, to the level above. One of those nearest the center would serve for this purpose, or if much timber be required in the stope, the second raise on each side of the crosscut should be put through. The superintendent must exercise his own judgment in these matters. The remaining raises need only be carried up as the stope advances, being cribbed and used as mill-holes, for the passage of ore, all waste being retained in the stope for filling; additional filling must be obtained from the walls or from the surface; but in the system of mining here proposed, the prompt extraction of the ore from any stated block would probably render filling unnecessary, for the closing up of the fissure by swelling of the slate or caving of the walls after the removal of the ore would be a matter of small consequence. Here, again, the superintendent must use judgment, and if filling be necessary, it must be supplied from some source.

Employing this system of mining, it is evident that the gangway on the vein need only be kept open so long as necessary to remove the ore from the block above the crosscut. This system possesses the additional advantage of stoping the ore in alternate blocks if desirable, though in most of the mines this would be of doubtful benefit.

The system proposed is not inflexible and may be adjusted to meet various conditions. For instance, if the ground be particularly bad, an inclined raise may be driven from the main foot-wall gangway, to reach the vein at a point midway of the two levels, and an upper or intermediate stope be opened at that place, which is worked upward to the main level above, while the stope from the level below goes only to an intermediate drift. The employment of this system must necessarily, if properly directed and vigorously prosecuted, shorten the time required to remove a block of ore, and the gangways cut in the heavy vein need only be once timbered, as in most cases all of the ore in the block immediately above the gangway sections would be removed before extensive repairs became imperative, thus cheapening the cost of mining—something which every earnest superintendent constantly strives to accomplish.

FITTING PIPES.—If, when a piece of pipe is screwed into a fitting it is out of line, it is a very simple matter to determine, by turning the pipe a half-turn, whether the trouble is in the fitting or in the pipe. If the pipe then maintains its original alignment, the trouble is in the fitting; but if the pipe slants in the opposite direction, it is apparent that the difficulty is in the way the threads have been cut on the pipe. Crooked threads on pipe are usually threads that are cut by dies in stocks, and are caused by the fact that the distance between the die and bushing is too short. In cases where the bushing is badly worn, the die is as apt to cut a crooked thread as a straight one, as the bushing does not keep the die in alignment with the pipe.—*Valve World.*

MAGNESITE IN CALIFORNIA.—Magnesite is used not only as an ingredient of magnesite brick, but also in the manufacture of carbonic acid gas and in the manufacture of paper from wood pulp. The carbonic acid gas is liquefied and shipped in steel cylinders to all the Pacific coast and southwestern States, where it is used for soda-water fountains, for refrigerating machines, and for maintaining the pressure on beer barrels and keeping the beer fresh. In the manufacture of paper, magnesite is transformed into a sulphite of magnesia and used as a digester for the wood pulp. Small amounts of magnesium chloride are used for making cement. Combined with asbestos, magnesite is also employed as a filler in steam-pipe casings. But it is as a material for the manufacture of refractory brick that magnesite finds its only considerable market, and with the development of that industry in this country the exploitation of California's magnesite deposits would greatly increase. Magnesite is a native carbonate of magnesia.—*U. S. Geological Survey.*

The Ore Deposits of the Ontario Mineral Belt.

Written for the MINING AND SCIENTIFIC PRESS by WALTER P. JENNEY.

Two erosions have occurred in this region. The earlier followed the continental elevation at the close of the Carboniferous, and occupied the time-interval until the advancing sea in the Mesozoic covered the hills and deposited the great thickness of shale and sandstone along the northern flank of the lode. The later erosion appears to have begun in the Jurassic and to have continued until the present time. Much of this recent denudation of the surface has taken place since the formation of the vein-fissures and the deposits of ore. Over the outcrop of the Ontario mine, the combined effect of these two erosions removed the whole thickness of the Upper Carboniferous limestone, together with 500 to 700 ft. of the underlying Ontario quartzite.

Owing to this late erosion, which has carried away the upper parts of the veins with the enclosing stratified formations, many verticals that formerly reached to veins (on their rise) at a higher level, now terminate at the surface. Some few seem to have been 'run off' verticals, short-circuiting the vein with the surface. In the deposition of the mineral, these fissures which leave the hanging wall and go directly to the surface, were the paths of escape for the spent waters and vapors—the run-off from the lode after the circulating solutions had been deprived of their metallic burden. (See Fig. 1). If the lode be compared to a river, fed by numerous branching streams, these short-circuiting verticals become the delta-phase of the circulation. Not infrequently these fissures carry ore and form workable branch-veins, uniting with the main lode in depth. More often they are barren, even where they depart from an ore-shoot. It is noteworthy that the crest of an orebody is usually situated at the intersection of the lode by a fissure of this kind; also that in some instances, on the approach to the surface, the fault-movement of the lode is distributed over the several branches. Naturally such branchings weaken the vein, and it may be found to be barren in its upward extension beyond the place where it splits.

There has not been found any certain evidence of fissures older than the latest igneous dikes. Such fissures as may have existed at the time of the last intrusion are now obscured by the subsequent block-faulting. When, however, the several fissure-systems are examined, it is seen that some are relatively older, and that the occurrence of a pre-existing fault in the general line of fracture has often influenced the formation of the more recent fissure. In some cases the younger fracture terminates at the older; in other instances, the course of the younger is broken at the crossing; while the fault, although of earlier formation, is not cut or faulted by its intersection. In still other occurrences, the younger vein or vertical is bent out of its course at the crossing; in a few cases, usually where the fissures intersect at an acute angle, the younger captures and follows for some distance the older fracture, finally breaking away and pursuing its former direction. An example of the capture of an older fault by a vein is seen in the 1,400-ft. level of the Daly Judge mine. (See Fig. 2). A strong, normal fault, two feet wide, producing a vertical displacement of the strata of nearly 100 ft., is intersected at an acute angle by an east-west vein, four to five feet broad, coming from the west. The vein impinges upon the fault-plane and follows it for 50 ft., the hanging wall of the fault forming the hanging wall of the ore, then it crosses, the conditions are reversed, and the vein follows the foot-wall of the faulting fissure, finally departing, on the opposite side from which it entered. Throughout the distance of 150 ft. that the fissures are united, the shoot is enlarged to a width of 8 to 10 ft., but terminates 50 ft. east of the point of separation. The ore is pyrite, low in silver, with scattered bunches of galena, workable only in places. Each fissure is readily identified by the lines of movement, which are well preserved even when the fault and vein are merged in a common channel. The striations on the walls of the fault pitch at 60° to the east, while the vein-walls are deeply grooved horizontally.

All the volcanic rocks of the Mineral Belt are cut and faulted by the veins; even the latest dikes of dark-colored basic porphyry are faulted by them. Orebodies are frequently found to terminate against a fault-plane, but investigation shows that in each instance the ore was deposited subsequent to the formation of the fault. In fact, with the exception of minor displacements due to the settling of the dislocated strata, post-mineral faults do not occur in the explored parts of the belt. As stated, the last prominent geologic event appears to have been the formation of vein-fissures and verticals, succeeded by a prolonged period of comparative quiet, during which the ore was deposited. The time at which the deposition of mineral took place cannot be definitely fixed, except that it occurred in the interval between the opening of the Tertiary and the last Glacial epoch. On the northwest flank of the Mineral Belt the ore-bearing fissures extend into limestone of Mesozoic age; evidence that the deposition occurred after the close of the Cretaceous. The other time-limit is fixed by the glacier-planed outcrop of the Mountain Lake copper mine at the head of Big Cottonwood. Consideration of the fact that the ore is younger than any of the igneous rocks, indicates a

Fig. 1. Cross-Section of Lode and Verticals.

This illustrates the draining of the circulation in a lode by 'run-off' verticals (AA and BB) which leave the hanging wall and carry the surplus waters to the surface, the lode being barren above the point of escape. In some instances, run-off verticals carry ore and become workable veins.

late origin for the mineral. We need more investigation into the age of the ore-formations of the Great Basin; all that can now be said is that these deposits of the Ontario Belt are probably post-Miocene.

All the mineral formations are referable to a single prolonged generative period. This is divided into an early stage, marked by the widespread deposition of pyrite, blende and galena, low in silver, and a late stage, distinguished by galena associated with tetrahedrite, rich in silver—a primary enrichment whereby the low-grade pyrite and blende first formed were removed and replaced by ore of a higher grade. These depositions are not everywhere found to be co-terminous in their extension; in some instances the late up-flow was confined in its circulation through the fissures to a given locality; in other places, the enriching solutions permeated the lode to the boundaries of the original orebody, or penetrated to the limits of the ore-shoot in the favorable horizon, while a broad area in the belt, mineralized by the first incoming waters, has, from some cause, escaped deposition in the second stage.

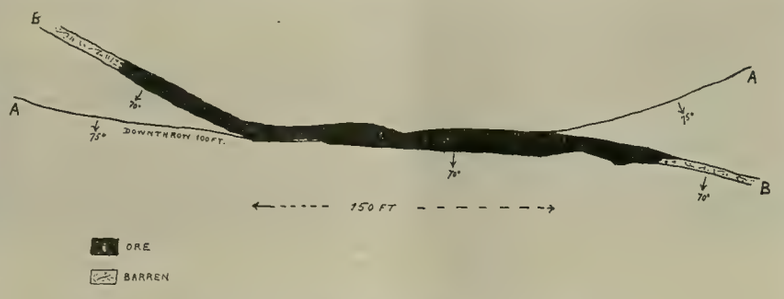


Fig. 2. Capture of a Fault Fissure by a Vein.

They have a similar dip and all displacements are prior to the deposition of ore.

There is evidence that the solutions which deposited the mineral in the lodes and certain veins (where the ore is confined to the fissure and does not extend into the walls) were of different chemical composition from the solutions replacing the limestone. It is thought that alkaline silica-bearing waters, deficient in carbonic acid, deposited the ore and quartz in the lodes, and that in the production of sheet deposits, neutral or acid waters, with excess of carbonic acid and poor in silica, dissolved the limestone and substituted ore for rock.

Oxidation extended to a depth of 400 to 500 ft. in the Ontario mine; in places, however, surface waters carried oxygen to greater depth, owing to the absence of organic matter in the Ontario quartzite. The secondary deposition of resin blende, derived from the upper part of the ore-shoot, reached from the 500-ft. level to below the 1,000-ft. level. But little secondary formation of galena appears to have taken place. The richest zone of the Ontario mine (situated as stated, where both walls were quartzite) between the 200-ft. and 1,100-ft. levels was due, first, to the extensive early mineralization; second, to the late re-inforcing deposition which reached to the confines of the ore-shoot; and third, to the overlap of the secondary enrichment by surface waters.

The Ontario Vein.—Ore comes to the surface in only a few places—the discovery of the Ontario was made in a basin formed by denudation, and it is probable, had erosion been a few hundred feet less, the vein would never have been found. This lode is a remarkable example of increase with depth (in so far, at least, as the body is confined to the quartzite), in the size of the ore-shoot and in some degree in the richness of the ore. At the surface, the width of ore was one to one and one-half feet and the shoot was less than 250 ft. long. As the vein was followed in depth, the ore went down nearly vertical on the east, but to the west it pitched at less than 30°, so that on the 600-ft. level the ore extended in a continuous sheet for 1,600 ft., with an average breadth of four feet. At the 1,000-ft. level the length of vein in ore was still greater, but the continuity of the shoot was interrupted. This expansion of the orebody with depth appears to have resulted from the peculiar conditions under which the lode was formed. In the ordinary type of fissure vein, produced by an elevatory movement commonly giving rise to an anticlinal fold, the tendency is to form fissures which are largest at the surface and contract with depth; the branch fissures also converge and are often found to unite as they are followed to the deep. If, however, the movement has been caused by a local subsidence of the crust, producing, as the case may be, either a synclinal fold or block-faulting, the disposition is for the fissures to increase in width and at the same time diverge in their extension downward. The fissures and the associated verticals of the Ontario belt were, as I have stated, produced by the differential zonal subsidence of the Uinta axis, accompanied by torsional-stress incidental to the irregular displacement. Another factor has been the deposition of the ore in the lode through verticals which occur of larger size and in greater number in the lower beds of the Ontario quartzite. The strength, however, of the lode-fissure increases with depth, as long as quartzite forms the walls, and for this reason the great expansion of the ore-shoot between the 300-ft. and the 1,100-ft. levels cannot be attributed solely to the influence of the verticals in localizing ore.

At the surface the ore assayed 80 oz. silver per ton and was completely oxidized. Rich ore carrying horn silver, resulting from secondary enrichment by surface waters, occurred between the 300-ft. and the 500-ft. levels. Below the 500-ft. level, blende was the prevailing mineral, associated with galena and gray copper, rich in silver.* The gangue was attrition material ground from the walls, mainly composed of quartzite, altered to quartz by the silicious solutions depositing the ore. The ore has deposited by crystallization in the interspaces of the gangue and by crystal-growth of particles of the metallic sulphides in the soft matrix. The prevailing character of the ore below the zone of oxidation was a mixture of soft, granular and crystalline sulphides in a loosely coherent quartz gangue. Crystallized minerals were seldom found, either in the Ontario or in the Daly mine. Horses of limestone are occasionally included in the lode, which have escaped alteration by the silica depositing waters. It is also noteworthy that neither the Ontario or the Daly vein have been found to make ore in the beds outside of the lode-walls; in this respect they are unlike the Back vein and other veins with a south dip, which form sheet-deposits in favorable horizons. Reasoning from the evidence afforded by the ore and the associated minerals, the deposition in the lodes was affected by hot alkaline waters, holding in solution the metallic sulphides and carrying silica in excess, but so deficient in free carbonic acid that limestone was not attacked. The examination of the flat-deposits formed through the verticals and the south-dipping veins confirms this, for comparatively less quartz has been deposited and the limestone has undergone extensive dissolution and replacement with ore. It is also observed in the lodes that quartz appears to deposit most readily upon some form of silica, such as quartz, and sand resulting from the crushing and comminution of quartzite. Igneous rocks with 50 to 60 per cent silica seem to be less readily silicified than quartzite, which in itself is almost pure silica. It is suggested that this peculiar selective deposition, whereby the silicious waters effected the alteration to quartz of the attrition quartzite of the lode, was by reason of that little understood chemical principle expressed by the phrase, "like seeks like," a phrase which is merely the record of an often observed fact.

The Ontario, while classed as a fissure vein, possesses features common to lodes, the filling of which is attrition material derived from the walls. The ore does not show any disposition to crystallize in parallel bands, but occurs irregularly deposited throughout the matrix. The walls of the lode are strongly striated and usually carry a thin clay selvage.

*The production of the Ontario to date is about $36,000,000, nearly all extracted from above the 1,500-ft. level.

The Daly Vein.—The reputation, justly earned, of this lode as an ore-producer,† rests upon the output of the great ore-shoot opened from the Ontario, through the Daly and Daly-West mines. The extreme length of the shoot, from its crest and termination in the upper levels in the westerly part of the Ontario mine, to the stopes between the 1,000 and 1,500-ft. levels in the Daly-West, is 4,600 ft. The pitch of this long ore-channel averages 25° to 30° from the horizontal. It crosses from the Daly mine into the Daly-West between the 600-ft. and the 1,000-ft. levels. For some distance westerly from the boundary the shoot is poor and contracted, but in the deeper levels of the Daly-West it opens out into large bodies of ore. In places, where conditions are locally favorable, the ore extends irregularly from the shoot, upward as well as downward, between the walls of the vein, forming fins, terminating in a thin edge—the dorsal and ventral fins of the ore-shoot. The width of pay-ore in the Daly mine averages three to six feet, and was in great part first-class shipping ore; in the Daly-West the shoot expands to an extreme breadth of 35 ft., mostly concentrating ore. The Daly vein is almost unexplored in the Daly–Judge property. The ore in the Daly–West is stated to assay, as mined, 6 to 7% lead, 6% zinc and 14 to 18 oz. silver per ton, together with a fractional percentage of copper and a trace of gold. It consists of an intimate mixture of crystalline galena and blende, with some pyrite and a very little chalcopyrite. Attrition material, altered to quartz, forms the gangue.

The Ore-Deposits at the Lime Quartzite Contact.—The same conditions have controlled the deposition of ore in the gray limestone at the contact with the quartzite. The lime-beds are the favorable formation, and the ore has been deposited where the beds are intersected by the veins and by the numerous verticals. The ore-formation, gently inclined or slightly rolling, conforms in each particular case to the dip of the faulted blocks of strata, in which the deposits occur.‡ The marked habit of the ore, to follow the long, sunken troughs produced by the block faulting, has been described.

The structure, as well as the chemical composition of the rock, have caused the gray limestone to be specially favorable to deposition. The position of these brittle lime-beds, held between the soft, pliable shales above, and the hard rigid quartzite below, has caused them to be shattered by the slightest disturbing movement; subsequently, in the deposition of ore, such fractured strata afforded free circulation to the mineralizing solutions, which in their flow were confined to these open fissured beds, by the much less permeable roof-shale and quartzite-floor. The quartzite and shale are only fractured where penetrated by the verticals; in the intervals between the fissures, broad stretches of both roof and floor are unbroken.

The gray limestone exceeds the other lime-formations in chemical solubility; the perfect manner in which great masses of the rock are replaced by quartz and by the minerals constituting the ore are evidence of this. Organic matter, contained in the limestone and set free by its dissolution, has aided in the reduction and the crystallization of the metallic sulphides; in fact, it may be said that the limestone has precipitated the ore.

The ore usually occurs uniformly disseminated, often replacing quite perfectly the original structure of the limestone, the bedding being preserved. The deposition of richest ore, and the most complete replacement of the lime-beds by the minerals, has taken place in the narrow belts of fractured rock, within, and in close proximity to, the fissures. From the very nature of their formation, the lateral extent of the orebodies is limited by the distance the mineral-solutions, entering through the verticals, could penetrate the fractured strata, substituting ore for the rock.

Ore deposits are not invariably confined to the special stratum of gray limestone, resting upon the upper quartzite, but occur under like conditions in other horizons in the upper limestone, where the structure and the composition of the rock is favorable. In the Crescent and other adjoining mines a number of distinct and productive ore-horizons occurred, situated in the upper strata of the black limestone.

In conclusion, the influence of the wall rocks has been discussed, and it has been shown that, in general terms, the Ontario and Daly veins were rich where traversing the Ontario quartzite, the ore high grade and concentrated within narrow limits, usually in a regular sheet, bounded by the fissure walls, with a great extension in depth and length. In the Daly, where the foot-wall was quartzite and the hanging wall formed by the upper limestone, the vein expands in width, large masses of lime shale, detached from the wall, occur in the fissure, the ore is distributed irregularly through the rock filling the vein and is commonly of lower grade; at the same time, the gross tonnage yielded by the stopes is largely increased. And that on entering the upper limestone this vein has been found, in a number of places, to be barren. These changes in the geological formations traversed by the Daly vein, while they have had a marked influence, are subordinate to the effect of the intersecting verticals, which have introduced ore directly into the vein at different points along its course.

The prevailing westerly pitch of the ore-shoots conforms to the inclination of the lines of intersection of the more prominent verticals with the vein. There is also a notable increase of width where such intersections occur, so that the breadth of an orebody frequently exceeds that of the fissure in the non-mineralized sections. The wall on the side that the vertical enters is broken and the vein-rock sheeted, diagonally fractured and brecciated, conditions most favorable to the formation of orebodies. Not only the larger verticals, but numerous branch-fissures and small verticals, do their part in thus preparing the ground for the admission of ore.

Exploration will, beyond question, develop many other ore-bearing fissures in the unexplored sections of the Belt. It has been noted that in the depths of the strata, verticals, linking the veins, occur, which do not appear at the surface; and that true veins carrying ore in regular shoots, may originate from the union of verticals. This system of veins and connecting verticals extends throughout the district, continuing to the greatest depth explored, without any marked change in the mineral character of the fissures.

The solutions depositing the ore in these veins have not followed the fissures upward from extreme depth, but have originated in sources deep-seated in the foot-country and have taken the most direct path, passing from vein to vein through the connecting verticals, finally escaping in outlets at the surface. While many contributory causes co-operated in the deposition of the ore, the most important factors were, the intersection of verticals; especially the formation within the vein of spaces of multiple-fissuring, by the complex intersection of a number of verticals, joined with the occurrence of wall-rocks, which afford, when crushed by faulting movements, an open rock-filling of the fissures, at once highly permeable to the mineralizing circulation and receptive to ore.

It follows, that under conditions similar to those here described, orebodies are to be sought in the veins without regard to depth below the surface. Examples of this localization of ore, irrespective of the surface (the deposition having been controlled by the occurrence of a favorable geological formation, conjoined with fissure intersection), are seen in the sheet-deposits replacing the limestone. In the Quincy mine, sheet-ore comes near to the surface; thence going west the ore follows the inclination of the 'trough' for over a mile, the depth below the surface increasing until in the Daly–Judge the deposits are 1,500 to 1,800 ft. deep. The pitch of the long ore-shoot of the Daly vein is another illustration; the orebody coming to the surface at the Daly shaft pitches west, and in the Daly–West is mined at a depth of 1 600 ft.; the position of the ore being determined by the occurrence of the Ontario quartzite as a wall-rock, together with the west pitch of the lines of intersection of the lode and the tributary verticals. The remarkable vertical range of ore of a uniform mineral composition remains to be considered. Ore comes to the surface in the Daly–Judge property at an elevation, 2,200 ft. above the top of the Ontario quartzite. It is estimated that erosion has removed 700 ft. of quartzite at shaft No. 3 of the Ontario mine, so that the ore on the 2,000-ft. level is situated 2,700 ft. below the top of the quartzite formation. This gives, in a length of less than four miles, a vertical range of ore of 4,900 feet; throughout this extent, the ore, while varying locally in the relative proportion of silver, lead and zinc, is substantially of similar mineral character.

The mountain range, or zonal type of block-faulting, is displayed in the region traversed by the Ontario belt, and we have a most interesting example of the inter-relation of outbursts of volcanic energy, with the Basin Range structure, and of the work accomplished by block-faulting in the preparation of the strata to receive the ore and in the formation of the fissure-system.

Buried beneath the Wasatch, where the range crosses the Uinta uplift, are the remains of a still older north-south mountain system which involves pre-Cambrian formations. The feature lines of these great mountain chains controlled the course of the Mineral Belt and the direction of the subordinate fissuring. But in tracing the relation, of the mineral deposits in their genesis, to the growth of the mountain systems in which they occur, we need only to go back to the east-west uplift of the Uinta range. There is manifest in the formation of the fissures and in the generation of the deposits, a unity of plan—a systematic development—which had its beginning with the creation of the Uinta axis and culminated in the expiring volcanic eruption that accompanied the elevation of the Wasatch range and the evolution of its great fault-belt.

†The Daly mine, from a length of less than 1,500 ft. on the vein, produced nearly $10,000,000.

‡See Fig. 2, Page 55, January 27, 1906, MINING AND SCIENTIFIC PRESS.

THE oft-repeated statement that sailing vessels have reached the limit in carrying capacity, and that steamers are gradually forcing the 'wind-jammers' out of the trade, is not borne out by press dispatches from Bremerton, Washington, which tell us of the launching of a sailing ship of 8,000 tons burden, this being the largest of its kind ever constructed.

On Saving Platinum.

Written for the MINING AND SCIENTIFIC PRESS by DENNIS H. STOVALL.

During the past two years the discovery has been made that the old-channel placer deposits of the Pacific coast, contain much platinum as well as gold. This important truth was further demonstrated by Dr. David T. Day, of the United States Geological Survey, in the experiments conducted at the Lewis & Clark Fair this year. But previous to these experiments a few managers of the larger hydraulic mines of southern Oregon and northern California, were at work saving the precious sands from the mass of debris scooped from the sluice-floors at clean-up time. One mine, the Deep Gravel, in the Waldo district, southern Oregon, saved nearly 20 oz. of platinum during 1905. Considering the fact that but 110 oz. of platinum were reported as mined in the United States during 1904, this showing of one mine is exceptional.

The method of saving the platinum adopted by the hydraulic miners, is simplicity itself. The method was first hit upon by Manager Wimer of the Deep Gravel mines, and it will be used this season by nearly all of the placer mines of the coast, the diggings of which comprise old-river channels. Mr. Wimer found that cleaning the gold with a shovel, by scooping it directly from the sluices, and washing it in running water, as has been the custom since the early days of placer mining, meant a loss of all the platinum except the very heaviest particles. Only one-fourth of an ounce was saved where an ounce and three-quarters are saved now.

Miners have long known that the black sand, to which the placer gold closely adheres, contains platinum, and many methods of saving the rare metal have been tried. An attempt to save it by panning in the running water of the sluice, resulted in as great waste as cleaning-up by shovel. Another method was to save the platinum sand by a system of undercurrents attached to the sluices; this was the method introduced by representatives of the Welsbach Gas Mantle Company, which uses platinum in the manufacture of its articles. The company supplied drawings of plans to all miners who desired them, that the saving of the rare metal might be encouraged. The same method was followed by the Waratah Minerals Company. But the undercurrent never became popular with hydraulic miners, because it was not successful. Undercurrents require close attention, and the cleaning of them is tedious, too tedious for the average placer miner, whose whole inclination is toward getting gold; moreover, the required undercurrents were different from those used for saving flour gold.

So, after many experiments and repeated trials of various methods, the only feasible plan is found to be the old-time and simple way of panning in still water. The platinum occurs in thin, flat flakes. Though it is a heavy metal, its atomic weight being 195 2, and its specific gravity 21.5, the thin flakes float easily on running water, and will not settle with the gold. It is therefore impossible to save it by scooping up black sand and gold together, and washing the amalgam free of foreign particles in the sluice.

As stated, the only paying method is by panning the entire mass in still water. A big tub, made for the purpose, is employed. The black sand and gold are scooped from the sluice-floor, after the riffles are lifted and rinsed, with a sharp shovel, and carefully panned over the tub. The amalgam is then freed of the black sand. A part of the platinum spills over the pan during the panning process, but it drops and settles into the tub, instead of being washed away, as would occur were the panning done in the running water of the sluice. By careful work, a great portion is saved during the first panning; that which falls into the tub is panned out later. The residue, which consists of platinum and gold particles, held as an amalgam, is then put in a blow pan and dried, after which the gold and platinum fall apart and are easily separated. The two metals are then put in separate flasks, and are ready for the refinery. Old-channel platinum has the appearance of black powder, with the exception that the flakes have a greater metallic luster than powder grains.

CAPPING A HOISTING ROPE.—A good way to cap a hoisting rope is said to be as follows: First, examine the rope and see that every necessary wire is present; then slip on three bands or hoops made of iron of varying sizes, the smallest going on first and the largest last. Then lap round the rope, at a distance of 9 to 12 in. from the end, some copper or galvanized wire; untwist the rope and cut every alternate strand a little shorter than the rest, so that, by doubling them back, we create the formation of a cone. Over this a tight wrapping with copper wire is necessary, which gives a cone-shape to the end of the winding-rope, largest at the end and uniform all the way up. Upon this the cap is placed, which is first made hot and carefully shaped by the smith, so that it exactly fits the rope. The cap in shape is in the form of a loop with two long ears; when placed in position on the rope end it is hammered down tightly to the prepared cone. Finally, the hoops are driven down tightly into position, and should be equidistant from each other.—*Engineering and Mining Journal.*

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock specimen from Coffee, Cal., is diorite. No quartz is seen in the specimen.

The rock from Cecilville, Siskiyou county, California, marked K. S., is a greatly altered diorite. It contains pyrite, epidote and calcite.

The fossiliferous rocks from Eagle mountains, in northwestern Oregon, are sandstone. The fossils are too indistinct to be positively identified, but are probably Cretaceous.

The samples from Independence, Cal., are: No. 1, quartz, probably gold-bearing, and diorite, with a little pyrite; No. 2, much altered granite; No. 3 quartz, with considerable carbonate of lime.

The rocks from Randsburg, Cal., are: No. 1, altered and iron-stained country rock (limestone); it may be gold-bearing. No. 2 is iron-stained calcite (carbonate of lime). No. 3 is felsite, an intrusive dike rock.

The rocks from Happy Camp, Siskiyou county, California, are: No. 1, felsite, an intrusive rock; No. 2, an altered intrusive rock, probably diorite or grano-diorite; No. 3, amphibolite schist. No. 4 is very similar to No. 2.

The ores from Sisson, Cal., are: No. 1, blue quartz containing yellow copper sulphide (chalcopyrite) and bornite (also copper sulphide). No. 2 is quartz containing pyrite; there is also a considerable development of calcite in the rock; it probably is gold-bearing. No. 3 is an admixture of quartz and feldspar; it contains pyrite and may be gold-bearing. There is no evidence that either No. 2 or 3 will contain copper.

The rocks from Pinos, Mexico, are: No. 1, quartz-porphyry; No. 2, vitrophyre (volcanic glass); No. 3, argillite; No. 4, impure limestone. No. 5 has the appearance of a mineralized, eruptive rock. It contains some quartz and much iron oxide. It may be gold-bearing. No. 6 is a volcanic rock, allied to diabase. No. 7 is chert, possibly an alteration of limestone. No. 8 is argillite. No. 9 is limestone. No. 10 is also limestone.

Connection of Survey Officials With Technical Publications.

The following is the order sent by the Director to the members of the United States Geological Survey:

Since the organization of the Geological Survey it has been the policy of the Director not only to permit, but to encourage its members to publish in technical and scientific journals and in the transactions of societies technical and scientific articles, provided they do not anticipate the official publication of the results of specific investigations, of which the priority of publication rests with the Geological Survey. It has always been believed that the widest dissemination possible should be given by this means to information in the possession of the Survey, particularly where the material to be published consists of information gained or conclusions reached as a result of general reading or observation, and is not the outcome of specific official investigations. Even if the writers receive compensation for such articles there does not appear to be anything objectionable in the practice, provided the writing is done outside of official hours.

When such articles are based on information that has been obtained in specific investigations, but (a) is contained in official reports already published or in press, or (b) is not considered appropriate for incorporation in an official report, permission to publish should be obtained from the Director, and the fact should be stated in the article.

There does, however, appear to be some question in respect to the propriety of Survey officials being identified as editors or special contributors, or in any other intimate way, with technical or trade papers conducted as business enterprises. Such connection is apt to be used for advertising purposes and is calculated to bring criticism on the Survey organization. It is deemed best, therefore, while not abridging any of the privileges recognized in the preceding paragraphs, to prohibit such connection of Survey officials with the conduct of trade papers.

This prohibition is not intended to apply to connection with journals which are devoted entirely to the dissemination of scientific knowledge and which are not conducted for profit or as business enterprises. Such publications are *Science*, the *National Geographic Magazine*, the *American Chemical Journal*, *Economic Geology*, *Forestry and Irrigation*.

The Miner's Ten Commandments.

I

Thou shalt not slumber late in the morning, but shalt rise ere it is day and break thy fast, for he that goeth late to the mine getteth no candles, causing the transgressor to grope in darkness and the shift-boss to indulge in profanity.

II.

Thou shalt not take up thy position in the center of the cage when descending or ascending the shaft, neither shalt thou appropriate in thy person more room than the law allows, for thou are but of little consequence among a whole cage-load of men, no matter what thou thinkest to the contrary.

III.

Thou shalt not hesitate on the station, or smoke thy pipe and talk politics with the pumpman, for verily the shift-boss might suddenly appear, and heaven help thee if he findeth the chutes empty.

IV.

Thou shalt not mix waste with the ore, neither shalt thou mix ore with the waste, thou nor thy partner, nor the mucker within thy drift, for surely as thou doest these things the mine will stop paying dividends, and thy name will be 'mud' over the length and breadth of the camp.

V.

Thou shalt not eat onions when going on shift, even though they be as cheap as real estate in Clifton, unless thy partner participateth likewise, for that bulbous root exciteth hard feelings in the heart of the total abstainer, and causeth the interior of a mine to be an unpleasant place.

VI.

Thou shalt not address the boss by his Christian name, neither shalt thou contradict him when thou knowest he is lying, but thou shalt meekly say 'Yes' or 'No' to all that he suggests; and laugh when he laughs and keep on laughing when he relateth a story, even though it be older than thy grandmother.

VII.

Thou shalt not steal thy neighbor's mops, nor his picks nor his drills; neither shalt thou carry away on thy person or in thy lunch-basket low-grade ore from the mine, for thou wilt find it will take a lifetime to obtain a mill-run.

VIII.

Thou shalt not have an opinion concerning thy place of work, for thy employer payeth a fat salary to a school-of-mines expert for constructing in his mind bonanzas that don't exist, so thou shalt refrain from theorizing, and concentrate thy efforts on drilling and the blasting of an abundance of powder.

IX.

Thou shalt not, in order to breathe, steal from the drilling machine compressed air intended for drilling purposes. Thou shalt not go on strike lest thou be turned adrift on a cold and cheerless world; neither shalt thou demand thy pay, for the company's directors in the East know not that thou liveth, neither care they a tinker's dam.

X.

Thou shalt work and break ore every day, the Sabbath included, for verily the board of directors aforementioned hath assumed the prerogatives of the Almighty, and if thou refuseth to toil as they dictate thou and thy dog and all that thou possesseth will soon be hitting the trail for Tonopah.—Sam M. Roberts in the *Tribune-Review*.

LOW COST OF DRILLING.—It is the constant aim of the mine operator to reduce the cost of drilling incidental to the extraction of ore and the search for new orebodies. At Cripple Creek the system of working mines by lessees has tended to cheapen operating costs, and good records for economy have frequently been made. John Sharp, the lessee who is operating the Morning Glory of the Work Company, and the Colorado Boss of the Cripple Creek Consolidated Company, furnishes data covering a period from September 20, 1904, to January 17, 1905, during which time there were 1,367 drill-shifts. As shown by his books, during that time the coal bills amounted to $1,183.17. The greatest number of shifts worked in one month was in October, when 492 were employed. The rock hoisted amounted to 7,500 tons during the months of October, November and December, and the coal bills for hoisting amounted to $450, leaving the total coal bill for running the air compressor $733.17, or 53.7 cents per drill-shift. In speaking of this accomplishment in economical operation, Mr. Sharp said: "I think that my record for making air per drill-shift is about as low as it can be made. The machine used was a straight-line compressor with simple steam and compound air cylinders, and was built by the Sullivan Machinery Company of Chicago. It is supposed to operate only ten drills, but often exceeded the rated capacity."

Repairing Broken Cross-Wires.

To repair broken cross-wires in a transit or level, a small bottle of shellac dissolved in alcohol and a cocoon of spider web are needed. The only tools required are a pair of dividers or a six-inch piece of soft wire bent to a U, but if neither is available a forked stick will answer. The dividers, wire or forked stick should have a small piece of beeswax pressed around each end to hold the web. The best cocoons are yellowish-brown, about ¾ in. long. They may usually be found in dead or hollow trees, or under the bark of old stumps. Good ones may often be found under rocks or in old barns or greenhouses. Occasionally single webs, which may be used in an emergency, may be taken from grass or bushes or limbs of trees; these are generally rough and dirty, but some of their defects may be removed by gently rubbing them with a small stick. If a very fine web is needed, it may be secured from a small white cocoon. A good cocoon will furnish enough webs to last for years, and each chief of party should have one packed with the shellac in his instrument-box. The best web obtainable can be secured by making a spider spin one as he falls from the end of a stick. A small spider will probably spin a fine web, and a larger spider, a coarser web; such webs are always smooth and free from dust. If the spider is made to jump from the end of the dividers or forked stick, the web can be wrapped around the ends and so be in position for immediate use.

Take the instrument which needs the new cross wires to a place sheltered from wind and dust. Unscrew and remove the eyepiece-slide without disturbing the object-glass. Take out two opposite capstan-headed screws of the four which hold the cross-wire ring in its cell and loosen the other two. Using the latter as handles, revolve the ring 90° and insert one of the pointed sticks through the end of the telescope tube into a screw-hole, and, while using it as a handle, remove the other screws and take out the ring. Clean the lines of the reticle ring from all old shellac or dirt and lay it on a board or table with the marked side up. Draw some of the web from the cocoon, either with the fingers or with one of the moistened pointed sticks. Keep pulling and working the tangled mass until an inch or two of single web is drawn out. Attach the ends of the web to the dividers, or wire, by winding them around the wax and pressing them in with the fingers, or wind the web around the forked stick, fastening it with shellac. Examine the web for defects by means of a pocket magnifier or the eyepiece from the telescope. If the web is satisfactory in size and quality, moisten it by dipping it in water for a few seconds, or by breathing gently on it a few times. As the wet web lengthens, take up the slack by opening the dividers, or by bending the wire or stick, but do not attempt to stretch the web more than about $\frac{1}{16}$ in. from its original dry length. Place the web (still on its holder) carefully over the reticle, allowing the holder to rest on the table, thus stretching the web slightly, and move it about until it falls exactly in the center of two opposite lines, using a magnifier to insure accuracy. Put a small portion of the liquid shellac over each side of the web about $\frac{1}{16}$ in. from central opening of the reticle and leave undisturbed for three or four minutes, or until the shellac hardens. While the shellac on one web is drying, another can be prepared. After all are set, replace the reticle in the telescope by reversing the method used in removing it. When in place, the cross-wires should be on the side of the rig toward the eyepiece.—E. M. Douglas in *Engineering News*.

ANTIMONY.—This metal is a white, very brittle metal, of laminated or crystalline texture. It fuses at a low temperature and readily vaporizes. It is not used in the pure state, but it forms several valuable alloys and compounds. The most important alloys of antimony are type metal, britannia, pewter, and anti-friction metals. Type metal consists, essentially, of lead and antimony, often with the addition of small quantities of tin and nickel or copper. Britannia is a white metal alloy of antimony with tin, copper and bismuth, and is much used for tableware. Pewter is a similar alloy, but it contains a smaller percentage of antimony than britannia. There are several anti-friction alloys which usually go under the name of babbitt metals. One of these consists of 50 parts of tin to five of antimony and one of bismuth, but other proportions are in use. The addition of antimony to lead hardens it, and the addition of a small quantity of bismuth gives the alloy the property of expanding at the moment of solidification from a molten state, thus producing a perfect cast from a mold. This property is made clever use of in the linotype machine.

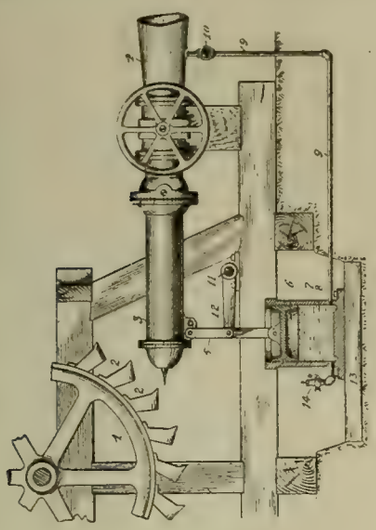
FULLER'S EARTH.—The characteristics of fuller's earth are its variegated color—greenish-white, gray, brown, olive, or olive-green—soft texture and greasy feel. In appearance it resembles clay, and when placed in water will fall into powder, but does not become plastic. The composition varies greatly, chemical analyses of the commercial grades showing a content of 50 to 63% silica, about 10% alumina, from 5 to 10% water, and a fluctuating percentage of iron, calcium, magnesium and other impurities.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 30, 1906.

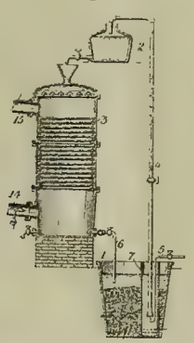
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

HYDRAULIC SUPPORT FOR DEFLECTING NOZZLES.—No. 810,756; G. J. Henry, Jr., San Francisco, California.



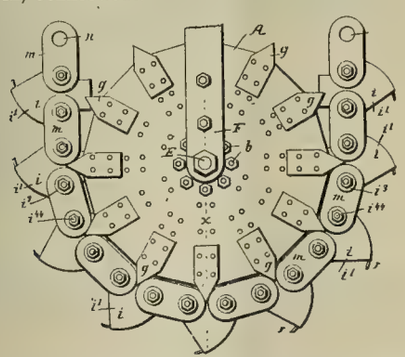
The combination with a deflectable nozzle, of a main pipe to which the same is pivoted, a pressure cylinder, of connection between the cylinder and the main pipe, a piston working within the cylinder, connection between the piston and the nozzle, and means for imparting movement to the nozzle so as to place the stream discharged therefrom in whole or in part onto the buckets of a water-wheel.

APPARATUS FOR PRODUCING COMPOUNDS OF TIN.—No. 810,897; C. E. Acker, Niagara Falls, New York.



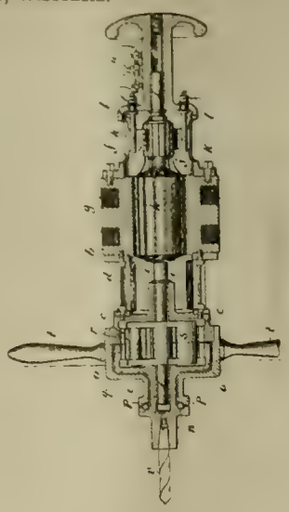
An apparatus for producing chlorin compounds of tin, comprising a dissolving vessel for effecting the solution of tin in a solvent containing chlorin, a reaction-tower, means for circulating the solution through dissolving vessel and reaction-tower, means for producing a gaseous mixture containing chlorin and a diluent in sufficient proportion to prevent undue rise of temperature, and means for delivering mixture to reaction-tower.

CONVEYER-SCOOP.—No. 810,917; W. Crossley, West Haven, Connecticut.



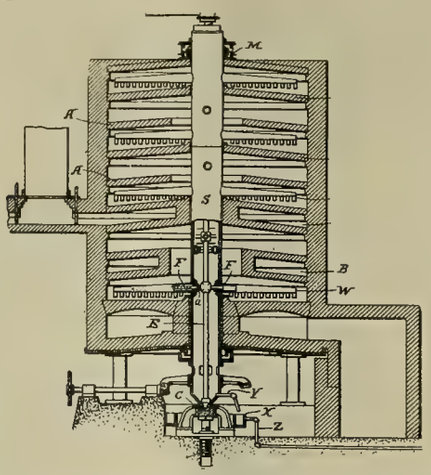
In a dredging machine a conveyer-scoop, comprising in combination a pair of ends or heads, each provided with a pair of flanges around its periphery, forming an intervening groove at right angles to the plane of the head, and a series of longitudinal staves or sections forming the body part or shell of the scoop having their ends secured in the grooves of the heads and connecting the heads.

ELECTRIC DRILL.—No. 810,444; Charles W. Theil, Milwaukee, Wisconsin.



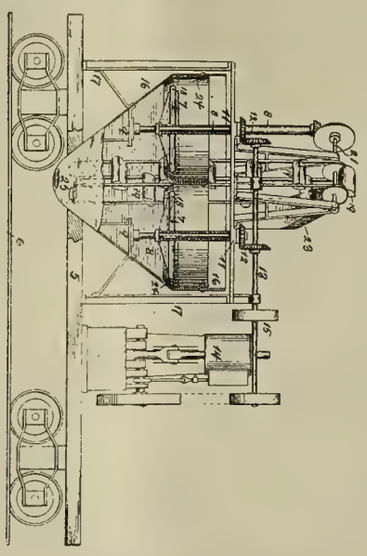
In an electric drill the combination with a suitable case or frame, of a motor-armature and a rotary drill-holder mounted co-axially therein, differential internal gears, fixed one to the drill-holder and the other to frame, and a crank fixed to the armature-shaft and provided with a pinion which meshes with both internal gears, drill-holder being rotatable and the case stationary relatively to each other and the armature-shaft.

ROASTING FURNACE.—No. 809,953; O. Hofmann, Argentine, Kansas.



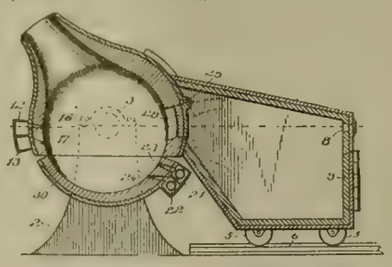
The combination in a roasting furnace, of a pipe, hollow radial arms extending therefrom, and water-supply pipes arranged to deliver water into arms, water-supply pipes being provided with spraying means.

ORE-WASHING PLANT.—No. 810,196; F. Eggers, Cincinnati, Ohio.



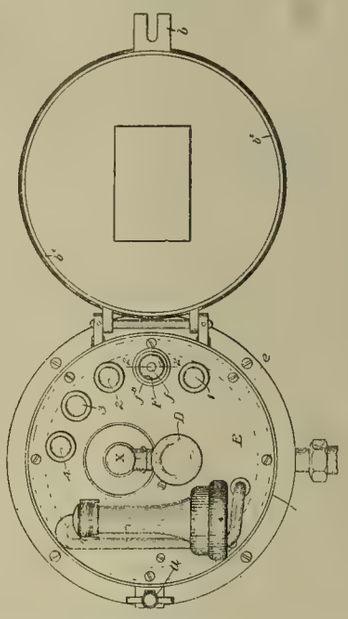
In an ore-washing plant, the combination of a common water tank, a group of circular ore separators arranged therein, means to rotate them and stationary partitions in the upper part of the tank which surround each separator to confine the effect of the operation of the same to the space so surrounded.

CONVERTER.—No. 811,006.—G. T. Walker, Washington, District of Columbia.



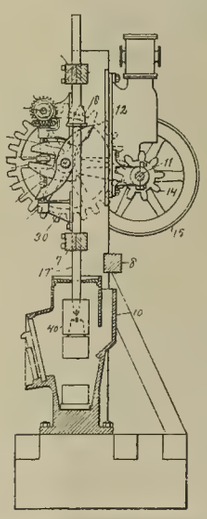
The combination with a converter, of a slag-receptacle associated therewith, slag-receptacle being arranged in close contact with said converter in such manner as to exclude the air from receptacle, means in said converter for agitating the metal, and means for removing the slag and impurities from the metal in the converter into the slag-receptacle.

TELEPHONE FOR MINES.—No. 811,029; A. F. Boardman, Somerville, Massachusetts.



In a telephone, the combination with the case A, its door B and plate E of a telephone receiver C, telephone transmitter X, a mouthpiece D for the transmitter, one or more push-button calls, and a contact maker and breaker F composed of the proper attaching and holding devices and the rod f, spring f', spring contacts f^4, f^4, insulator f^3, holding nut f^5 and contact ring f^6.

STAMP-ACTUATING MECHANISM FOR ORE CRUSHERS.—No. 811,079; W. S. McKinney, Chicago, Illinois.



In a stamp-actuating mechanism, the combination of a main shaft and driving gear thereon, a cam shaft arranged to extend parallel with the main shaft, a gear and cam on cam shaft, latter gear arranged to intermesh with the gear of the main shaft, links pivotally supported concentrically with the main shaft and supporting at their swinging ends the cam shaft, adjusting devices operatively connected with links, and stamp stem provided with a tappet, arranged to reciprocate adjacent to cam shaft.

Mining Summary.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

LONDON, February 31.

The annual accounts and reports to June 30, 1905, published last week by the Van Ryn Gold Mines Estate, Ltd., merit the attention of all those interested in Rand mining, whether professionally or as speculators. During the year 221,010 net tons were mined and crushed, yielding gold valued at $1,688,139.50. The recovery was $7.46 per ton. Net profits were $504,579.45, after deduction of all charges on revenue account in South Africa and at London. The working costs amounted to $5.02 per ton, namely, mining and general mine charges $2.64, milling and cyaniding $1.24, general expenses 24c. and development redemption 90c. The charge of sand and slime in the cyanide treatment averaged 3.44 dwt. and the residue 0.81 dwt. A trial was made with a new type of slime machine with a vacuum-separator but it proved unsuitable. From July to September, 1904, 80 stamps were running, the number being increased on the arrival of 1,150 Chinese coolies in October, to 100, and further to 160 in February, by which time the coolies had received preliminary training in their work. The duty per stamp averaged 5.188 tons per day. The mine development during the year amounted to 14,812 ft. at a cost averaging $12.45 per foot. The sinking of the main shaft cost by itself $69.34 per foot, inclusive of pumping and equipment. The ore reserves were increased by 51,300 tons, the total as on June 30 being 437,074 tons. This estimate is based on the arbitrary limit of payability—8 dwt.—and average widths of the main reef leaders, partly at 48 in. and partly at 72 in., with a stoping unit of 36 in. In the past year these widths were exceeded in the stoping by 30%, while the ore developed was of the same grade as in previous years.

The balance sheet shows that the capital of the company—£500,000—is accounted for, in round figures, by the cost of the property (£200,000) and the values left in the balance sheet, after depreciations, of the permanent works, machinery and plant buildings, etc., and cost of labor supply. An amount of $251,521 for development is also left in the balance sheet representing 58c. per ton on the ore reserves at the end of the financial year. The liabilities, including a dividend of £50,000 paid in July, exceeded the liquid assets by about £38,000. No estimate of the net value of the ore reserves is given, but it is to be noted that the consulting engineer, Mr. G. A. Denny, reports the profit per ton milled during the year (after writing off 90c. for development reduction) as $2.67. At the present rate of working the reserves appear to be about two years ahead of the milling capacity. The profits for the six months of the current financial year to December 31 amounted to £68,000, say at the rate of 27% per annum on the nominal capital. The present market price (£2⅜) of the £1 shares would seem to be based on this increased rate of profits rather than on any valuation of the mine which might be made from a study of the foregoing particulars of the net assets of the company, and without taking into account the attitude of the new Government on the labor supply agitation. On the subject of the Chinese coolie question the managing director remarks that one of the heaviest items of excess on original estimates of capital outlay was the "luxurious accommodation" provided for the coolies, to comply with the regulations of the Foreign Labour Department.

The last quarterly report for 1905 issued by Briseis Tin Mines, Ltd., marks substantial progress, the output of black tin having been 321½ tons compared with a total for the previous three quarters of 650¾ tons. The company was formed in November, 1899, with a capital of £600,000, to work deposits in the hills at Derby, Dorset county, Tasmania. The local water-supply having proved inadequate for hydraulicking, races were constructed at a cost of £67,500. The estimated cost of £22,000 for the main or Ringarooma race was greatly exceeded owing to unexpected difficulties, especially at one particular point. This race extends over a line of nearly 30 miles, through a rough and mountainous country with dense bush and forest. It is said to be capable of conveying at least 21,600,000 gal. per 24 hours. The race came into operation early in 1901, but various mishaps occurred up to 1902 which had the effect of delaying the removal of the overburden preparatory to the starting of work on the tin gravel. The overburden was also found to contain more hard material than the estimates provided for, to the extent that in 1903 the boulders of basalt on Briseis hill averaged as much as 12% of the whole overburden removed. In the face of these difficulties it was decided to carry out a plan of working during 1904 by which all energies were directed to the removal of as much of the overburden as would enable the underlying gravel to be worked to the best advantage, only sufficient gravel being sluiced in the meantime to provide revenue for that purpose. The success of this policy is apparent in the more regular working of the mine, coupled with a largely increased output of black tin during 1905. The lower cost of production and the high price of tin during recent months have enabled the directors to declare a first dividend of nine pence per share. The average yield of the gravel treated for the past quarter was nearly 6 lb. black tin per cubic yard, as against 5.49 lb. in 1904. The black tin as dispatched from the mine is about 75% fine.

At the annual meeting of one of the great London banking institutions the other day, the chairman mentioned as a proof of the country's prosperity that a total of £167,000,000 of new capital was issued on the Stock Exchange in 1905, as compared with £123,000,000 in 1904. The summary of mining companies registered in England during 1905, as given in the *Mining Journal*, is as follows: For Great Britain, £3,478,808; Europe, £1,478,000; Asia, £3,133,350; Africa, £15,581,851; North America, £3,274,207; South America, £2,487,375; Australia, New Zealand, etc., £1,993,982; total, £31,427,573. Some degree of nervousness prevails regarding the outlook of the mining industry for the supply of capital in the new year. The financial world is not without apprehension that the screw may be put on by our new political masters, with their overwhelming Radical majority, in ways that may have a tendency to restrict enterprise, or at least to make wealth less remunerative, and thus diminish the spending power of the nation.

SALT LAKE CITY, Feb. 12.

Another new milling plant will go into commission in this State during the present week at the Sevier Consolidated mine, in Piute county, the initial capacity being 100 tons per day. The power plant, water system and mill represent an investment of $250,000. The Sevier property is near the Annie Laurie mine. Gold ores are to be treated under the Godbe process. Seymour W. Tulloch, of Salt Lake City, is president of the company.

There are some big deals being worked out now which affect Bingham and other Utah mining enterprises. During the past two weeks, the air has been permeated with rumors relative to the disposition of Bingham Consolidated. Stories have been coming from the East to the effect that the heavy buying of the stock in the markets of Boston and New York has been for American Smelting interests. Locally, this has not been accepted, for it was not believed those in control of the Bingham company would go into any merger except on a basis that would realize for them a price for the stock far better than had ever been quoted in the markets. The opinion has prevailed in Salt Lake that the Bingham Consolidated Co. would be more likely to follow the plan of the United States Smelting, Refining & Mining Co. and reach out into other fields for custom business. Everyone, apparently, has been at sea and those on the inside have successfully kept their plans secret, so the general public has been guessing as to what is likely to happen. Local officials of the Bingham company profess to know nothing, declaring they knew no reason for the activity of the stock in the Eastern markets. Developments during the past few days leave little doubt in the minds of well-posted mining men in Salt Lake that Bingham Consolidated is being counted on to go into a merger; that it is to be taken in by the gigantic combination of capital which seeks to control the copper and lead smelting business of the country. In this combination, it is believed, are American Smelting interests and Amalgamated. Not only is the Bingham Consolidated to be taken in, but, if the present plans are carried out, practically all the big copper mines of Bingham, except those controlled by the United States Co. This would include the Utah Copper, Boston Consolidated, Yampa and, possibly, the Utah Consolidated.

The statement comes from a reasonably reliable source that if the proposed merger is made, F. Augustus Heinze is to have the general management of the copper mining department. Three of his best experts, A. Franks in charge, are now conducting an examination of the Bingham Consolidated properties, but their movements are being carefully guarded and instructions have been given to everyone in authority to say nothing.

There is one story being circulated to the effect that the properties involved will be taken over in exchange for shares in the big company at various prices, on a fixed basis of measurement of value. The representation in the following is to be:

Amalgamated to be accepted on the basis of $150 a share; Anaconda, $100 for $25 shares; United Copper, $100; Bingham Consolidated, $75 for $50 shares; Utah Copper, $50 for $10 shares; American Smelting, common, at $200; preferred, at $150; Federal Mining & Smelting, at $200; preferred, at $125. United States Lead is also mentioned, but the basis is not stated. It may take several months to work out the combination, but it seems to be almost a certainty that the merger will be made.

The Shawmut Consolidated Copper Co. has installed an air compressor at its Bingham property and has inaugurated systematic development there. The mine is to be opened by means of a tunnel that will cut the ledges from 600 to 1,000 ft. deep. The mill on the property, and which was a failure because it was not provided with the proper machinery, will be remodeled during the year. The Shawmut Co. is also operating the Sedalia mine, near Salida, Colo., and with a small mill is making a profit of $2,500 per month.

During the month of January the mill at the Consolidated Mercur mine at Mercur handled an average of 900 tons of ore per day.

At the annual meeting of the shareholders of the Columbus Consolidated Mining Co. the following were elected: T. Jacobson, president; Clarence K. McCornick, vice-president; S. A. Whitney, secretary and treasurer, who, with W. S. McCornick and Edward R. Hall, the latter a Chicago banker, are directors. The mines are located at Alta. The corporation is out of debt and has $30,000 in its treasury. Some extensive bodies of ore have been developed during the past year. A mill of 125 tons' capacity is in operation.

It is believed that negotiations are still pending which will result in the merger of the Ontario with several other of the principal mines of the Park City district, including the Daly-West and Daly.

Ore shipments from Park City last week aggregated a total of 4,206,840 lb., the shippers and the amounts being: Daly-West, 1,150,000; Keith Kearns, 250,000; Jupiter, 11,000; Daly-Judge, concentrates, 446,000; first-class ore, 436,000; zinc middlings, 297,000. The significance of the foregoing is the record being made by the Daly-Judge, which began operating its mill and shipments of crude ore in the beginning of January. The mine will soon be the heaviest shipper in the camp, it being the intention of the management to close a contract with one of the smelters soon, after which will come an increase in output. Daly-Judge concentrates bring $40 a ton, the crude ore $45 and the zinc middlings $18 per ton, net.

Samuel Newhouse and D. H. Peery, of Salt Lake, have an option on the Ostergard and Mungerson groups of claims at Ely, Nev. M. M. Johnson, of the Newhouse staff, is to conduct an examination.

The property of the Butterfield Mining Co. at Bingham is being subjected to examination for an Eastern syndicate. So is the Silver Shield mine, also in Bingham, and the Carisa, in the Tintic district.

The construction of the new Garfield smelting plant at the south end of the Great Salt lake, by the American Smelters Securities Co., is progressing. Superintendent B. H. Bennetts says the first unit will be ready for commission the latter part of April.

The work of constructing the new Garfield mill of the Utah Copper Co. is progressing. Contractors are busy on the concrete foundations and office and warehouse buildings. For the main buildings the contract for steel structural material was let some time ago. No awards have been made, as yet, for mill equipment.

CALUMET, February 10.

The Lake Superior copper mines started the new year by producing approximately 19,000,000 lb. of refined metal in January. This is somewhat in excess of the average monthly production for 1905. At 18½c. per lb., which was about the average selling price of last month's production, the January yield was worth $3,515,000. While it is not likely that February will witness any important gain in the copper production of Michigan, the yield will be maintained, notwithstanding the shortness of the month. In March a good increase may be expected, as several different mines are increasing their facilities and planning to make a larger production. The Michigan mine, in Ontonagon county, produced slightly less than 200 tons of mineral last month. This is the largest output of any mine in that section for the same length of time. The Michigan is securing excellent results on the present market and is earning a fair profit. About 40% of its output last month was secured in the form of mass and barrel copper, which forms a large proportion of the mine's yield. The rock shipped to the Mass mill, on Keweenaw bay, and treated in that plant, averaged about 20 lb. mineral per ton stamped. As the Mass Consolidated Co. will require the use of its entire stamp-mill capacity within six months, it is expected that the Michigan will shortly begin preparations for erecting a mill for its own exclusive use. It owns a site adjoining the Mass mill, and also one in Ontonagon county. The former is more likely to be used, and an assessment will be required to provide funds for the erection of the building. The Adventure Consolidated, another Ontonagon county property, exceeded its former record, and produced more copper last month than in any previous month since it started work. The increase was secured mainly through the improvement in grade, the increase in the volume of shipments being slight. The Adventure's greatest promise is in its new shaft, No. 4, on the eastern portion of the property, where a lode well charged with copper is opened at the second level. If results at this shaft continue good, it is likely that railroad facilities will be provided.

Tamarack production suffered last month owing to the fire in No. 2 shaft, and the consequent suspension of work in that opening and No. 1 and 5 shafts. No. 3 shaft continued production, shipping more rock than usual. It is now a settled fact that the fire in the Tamarack is out. All that remains to be done before resuming work is to clear the workings underground of noxious gases. A large fan has been installed at the mouth of No. 1 shaft to facilitate the work of ventilation. Pumpmen have been able to descend 600 ft. in No. 2 shaft and adjust the pumps on the third level. In No. 5 shaft a large bailer is in use and the pumps are also in operation, the water having risen 200 ft. in the shaft while work was suspended. It is uncertain when the Tamarack will be able to resume work on a normal basis. Until the air is purified no attempt will be made to send miners underground. No estimate of the damage caused by the fire can be formed before that time. The Tamarack was making an excellent record just before the fire occurred, its rock shipments running between 2,800 and 3,500 tons daily. The Osceola amygdaloid has been furnishing a creditable yield. This bed is reached by crosscuts from the conglomerate workings at No. 1 shaft. Franklin produced 535,000 lb. refined copper in January, more than in any previous month in its history. The Franklin's gain was secured mainly through the improved character of the ground opened in the bottom of No. 1 shaft, at its Junior branch. At the twentieth level, in that shaft, the conglomerate is rich; the lode has been drifted upon 650 ft., and the rock is uniformly well charged with copper throughout. It is expected that No. 2 shaft, to the south, will run into similar ground when it reaches the same depth. A continuance of present results will enable the Franklin to make in excess of 6,000,000 lb. copper during the current year. At the Mohawk results show an improvement over those of the same period last year. The rock is yielding better. No. 1 shaft is opening good ground at its present depth, as is also No. 5. Preparations have been started for the compounding of the second head in the mill on Traverse bay. The stamp-mill contains four heads, all that the original plans called for. The last head to be installed is of compound type. With the second head compounded, the re-construction of the mill will be half completed. At an additional depth of 50 ft. the Isle Royale Co. will start drifting upon the Baltic amygdaloid bed from the new shaft. Sinking has now reached a depth of nearly 100 ft. While the rock is not mineralized, the lode is well defined.

ALASKA.

The steamer Leelanaw, from the Treadwell mines, on Douglas Island, has arrived at Tacoma, with 1,300 tons of ore for the Tacoma smelter, being the fourth Alaska ore shipment to reach Tacoma this year.

ARIZONA.

Mohave County.

T. Ewing, of the Vivian mine, near Gold roads, in San Francisco district, states that the company's new mill has begun operations.——The shaft at the Samoan mine at Chloride is sinking with air drills just installed.

Pima County.

The Helvetia has struck ore at the 800-ft. level after

drifting 250 ft. Operations are being carried on on a large scale at Helvetia, and miners are being added to the force.

Gila County.

The Iron Cap Mining Co., at Globe, has decided to develop their claims which adjoin the properties of the Arizona Commercial and Globe & Arizona Development companies, and the Bird group, which is under bond to H. A. Smith and H. B. Hoveland. M. J. Galpin, a director of the Iron Cap Co., will superintend the work, for which the company has $50,000 available. The shaft, now down 130 ft., will be sunk to 600 ft. and levels run.

J. C. Erman, superintendent of the Live Oak mine, near Globe, has returns from eight cars of ore shipped to the El Paso smelter, showing an average value of 13.60% copper. Shipments now reach nearly 100 tons a day.

Pinal County.

(Special Correspondence).—Mining in Mineral Hill district is becoming active.——C. M. Schofield has twenty men repairing roads and making other preparations for development on the Newburg group.——Mr. Champie has men doing assessment work on the Garrison group.——A. J. Schofield took men from Florence this week to begin the development of the Charlie Smith properties.——At the Alta Mining Co.'s camp several buildings have been completed and a townsite surveyed, and development of the claims is being pushed. This is one of the most promising mineral sections in the county.——The Guild Bros., who have a bond on the Maxfield Copper group, in the Owl Head district, are cleaning out the old workings and uncovering the old ore bodies, which yielded a large amount of high-grade ore. Frank Maxfield, owner of the property, has worked the property for twenty years in a small way and shipping the rich ore.——Alex. Sears has discovered a gold-bearing copper ledge in the Box Canyon district, and has begun development.——The San Fernando Mining Co., a California organization, has completed annual assessment work on its gold properties in Willow Springs district.——Wm. Dougherty has completed the annual work on the Chamberlain gold group, also near Willow Springs.

Phœnix, Feb. 12.

Yavapai County.

C. W. Platt, of the Monarch Co., reports that a reduction plant, including a mill, crusher and three tables, has been ordered for the mine at Wickenburg.——At the Apache-Panther mine, near Crown King, a station is being cut in the main tunnel, from which a winze will be sunk. A compressor has been ordered.——A new gasoline hoist has been installed on the new shaft at the Gray Eagle mine, near Crown King.——The Button mine at Crown King is being unwatered.——Geo. O. Ford has ordered a boiler, hoist, blower and a pump for the Ford mines, near Jerome Junction in the Mineral Point section. He states that sinking will be resumed at once, and that contracts have been let for cord wood and lumber.

James Douglas has recently examined the workings in the Senator mine, owned by Phelps, Dodge & Co. Superintendent Pickerell says the Ten-spot shaft is now being sunk to meet the raise from the Senator tunnel.

C. W. Platt has struck a nine-foot vein of gold ore averaging $14.50 per ton, also a vein of copper sulphide, in the Monarch Company's property, near Wickenburg. Fifteen men are employed.

The Monica mine has been bought by Morgan Tillinghast of Philadelphia for an Eastern syndicate in which he is interested. This group of 13 claims is 17 miles from Kirkland and seven miles northeast of Congress. Development has been pushed steadily, 2,000 ft. of work has been done and a large amount of ore is said to be blocked out. Heavier machinery and power drills will be put in.

John Lawler is at his mines at Hillside looking after work on the Hillside group.

CALIFORNIA.

Amador County.

The new lift pump at the South Eureka mine was put in operation this week after six months of preparation. The pump is installed at the 2,030-ft. level and lifts the water a vertical distance of 1,875 ft. The pump is operated by a 150-h. p. electric motor, and will be used to drain the South Eureka and the Central Eureka mines.

Mono County.

J. N. Kelly, Fred Pheifer and George Denham, of the Rio del Monte mine, near Bodie, who have been driving a tunnel, report having cut the main ledge last week.

The True Friend group of mines, near Masonic, are reported bonded to Salt Lake men represented at Masonic by T. V. Whitelaw.

The Mount Beatty Gold Mining & Milling Co. is preparing to sink a shaft at the Spotted Tiger mine, near Aurora. —— Hansen Bros., lessees of the Live Yankee mine, near Bodie, finished a raise last week and are now drifting on the ledge.

Nevada County.

The New York-Grass Valley mine is to be equipped with a cyanide plant.

A large pump at the Iron Clad mine, near Grass Valley, dropped to the bottom of the shaft owing to the breaking of a cable a few days ago, and now lies under 180 ft. of water. A duplicate pump has been ordered. —— The owners of the Ethel mine, near Grass Valley, are opening up the Baltic, which adjoins the Ethel, by driving tunnels from either end of the claim.

Placer County.

The Alverstone Copper & Gold Mining Co. has leased the R. P. Patterson mine, near Placerville, and has let a contract to run a tunnel 150 feet.

Sacramento County.

The crushing of the timbers at the Blue Ravine mine, near Folsom, caused an extensive cave under the oil tank, and work is suspended until the damage is repaired.

San Bernardino County.

Lyman Stewart, J. S. Torrance, F. A. Galbreath, S. J. Merrill, W. S. Staate, Giles Kellogg and C. E. Iredell have filed locations covering over 4,000 acres of land in this county, supposed to contain iron-ore deposits.

San Diego County.

General Manager G. H. Clarke, of the Cuyamaca Ranch & Mining Co., is preparing to enlarge the company's mill at Cuyamaca by the addition of 10 stamps.

Shasta County.

C. Gilzean, of Redding, C. Fox, of French Gulch, and others have bought the Washington mine at French Gulch.——The Mammoth Copper Co. is shipping matte to Bingham Junction, Utah, in new form. The matte is run into slag pots, after which it is broken into fragments weighing about 200 lb. each. Heretofore it has been shipped in ingots weighing 15 to 20 lb. —— The Sugar Loaf copper mine, near Kennet, is being opened up. —— The Mountain Monarch Co. is about to erect a large plant on the Colorado group, west of Shasta.

Superintendent S. E. Bretherton, of the Great Western Gold Mining Co., has engaged 12 eight-horse teams to haul matte from the Afterthought mine to the Terry Railroad. —— Joseph Holbrook is erecting an impounding dam on the Engels claim on Dry creek, near Igo.

Sierra County.

The Blue Gravel mine at Alleghany is being opened up by M. Walling. The main tunnel is being repaired.

W. W. Miller, of Berkeley, is now at American hill opening up the Johnson gravel mine, which has not been operated for over 30 years.

Siskiyou County.

The Blue Gravel mine, near Yreka, is to be equipped with pumping and hoisting machinery. The ground is to be drifted, and the gravel washed on the surface with water pumped from the mine. H. A. Corliss is manager.

The 10-stamp mill on the Hazel mine, near Hornbrook, has begun crushing.

M. Schuler, superintendent of the Ethel Lynn mine, on Horse creek, near Yreka, began piping a few days ago. The company's main ditch is now delivering 800 in. of water under a pressure of 280 feet.

Solano County.

The Solano County Miners' Association have organized at Vallejo, with P. B. Lynch as president and J. Chettle temporary secretary. The meeting was called to order by President Alfred Tregidgo of the California Miners' Association for the purpose of getting the business men of the city interested in the projected Government reclamation work in the Sacramento Valley, by means of which it is hoped to open up hydraulic mines in the American and Feather river districts.

Tehama County.

(Special Correspondence).—The main tunnel of the Basler Copper mine, near Lowrey, 30 miles west of Red Bluff, has been extended to the contact and a vein of copper sulphide cut. This ore is 700 ft. below the iron cap on the surface. Numerous stringers and small bunches of ore had been cut before reaching this orebody, some of which runs 15% copper, with a small amount in gold and silver. The main tunnel is in nearly 1,000 feet.

Lowrey, Feb. 13.

Trinity County.

Mark Manley, manager of the Enterprise Mining Co., has left for Boston to arrange for the equipment of the Union Hill mine, near Weaverville. —— The owners of the Bullychoop mine, at Bullychoop, are now shortening the aerial tramway at the mine.

The owners of the Shafter mine, at Deadwood, have driven the main tunnel 180 ft. since Jan. 1, and have let a contract for a further extension. This tunnel is expected to tap the ore body 1,676 ft. below the upper workings.

Tuolumne County.

J. N. Richards has completed overhauling the boiler, hoist and pump at the Louisiana mine, near Carters, and will begin unwatering the shaft in a few days. —— D. H. Atkins, of Sonora, has transferred his bond on the Oak Hill mine, near Sonora, to C. F. Stocking, of Chicago. The agreement provides for the installation of hoisting machinery, the sinking of a shaft 500 ft., and the opening of drifts. —— W. A. Nevilles has sold to T. W. Patterson, of Fresno, the Columbus mine on Moccasin creek; the Big Oak mine No. 2, near Big Oak Flat; 2½ acres adjoining the Rawhide placer mine; all of the surface ground on the Rawhide No. 2 quartz mine; and 2½ acres adjoining the Stewart property in the same vicinity.—— The owners of the Keltz mine, 10 miles north of Soulsbyville, have contracted with B. K. Mauna to extend the drift 250 ft. —— Three more stamps are to be placed in the mill at the Tapie mine at Rawhide. —— The owners of the Lady Washington and Dead Horse mines, near Carters, are surveying a tunnel to connect the two mines. —— H. J. Dykes is now unwatering the Rising Sun and Senorita, at Arrastraville.

COLORADO.

(Special Correspondence). — The mild winter has made it possible for many of the mining camps of the State to continue work without interruption. In some portions the snow has been heavy, and in those camps where it has been to, or above, the average, work has been interfered with materially, but in a majority of the camps the snowfall and extreme cold is below the average.——The Independent smelter, at Golden, which has been used for treating low-grade ores from Clear Creek, Gilpin and Boulder counties, will be re-opened under new management. There is plenty of ore in the counties named, which the Smelter trust seemingly does not care to handle, but which could be handled at a profit at the Golden plant. The reason for closing down the smelter before was on account of lack of capital. It is reported and also denied that Dr. F. R. Carpenter is to re-open the smelter. Negotiations are pending for the re-opening of the plant by parties with sufficient capital to insure continuous running. Since the closing down of this plant the trust has increased the rate $3 per ton on certain low-grade ore, which rate prohibits the shipping of the ore direct to the smelter.——Many improvements are being made at the different plants of the smelter trust to facilitate the handling of the large amounts of ore now being received.——Work is progressing as rapidly as possible on the overhauling of the old mill at Colorado City, recently purchased by the Golden Cycle Company.

Denver, Feb. 12.

Clear Creek County.

(Special Correspondence).—Mining and mill-men in this locality say that the rates have been raised on certain ores by the smelters, which prohibits the operators from shipping direct to the smelter. As a consequence of the advance several of the mills which have been closed down, or were running but a portion of the time, are now receiving more ore than they are able to handle running full time. The outlook for this district is encouraging.——At the junction of Clear creek and Fall river, the Dover-Billings Mill Co., David Ellis, manager, has erected a new concentrating mill, provided with rolls, jigs, tables and slimer.——Development work is being pushed by the Stanley Mining Co.——The heavy flow of water in the Lucania tunnel has decreased somewhat and work is progressing.——Some work is being done by the Big Five Co. in the Central tunnel. The ore from the Shafter mine is sent through this tunnel to the Hudson mill.——The Shafter Co. is driving to make connection with their shaft from the Central tunnel level. They are drifting on the vein and stoping. The distance yet to drive is about 700 feet.

Idaho Springs, Feb. 8.

The Alpine concentrating mill at Idaho Springs, with a capacity of 100 tons per day, is now running double shifts, with its entire capacity engaged on the treatment of ore from the Addudel mine in Russell gulch, operated by the Taawasa Gold Mining & Cyaniding Co. The equipment of the Alpine mill is particularly adapted to concentration of ore of the Addudel mine, and a satisfactory saving of values has been made on that class of ore.

Lake County.

The production of Leadville mines for January, 1906, is stated to be 79,000 tons. The industry in Leadville district is active and on the increase. Large contracts have been let for manganese ores, and much new ground in old mines is being blocked out.

In South Evans gulch several properties will double their output.——At the New Monarch, development work is being done in the Winnie, Cleveland and Lida, and from the New Monarch and Winnie about 300 tons of ore daily are being sent to the smelter.——The lessees on the Fortune are shipping 50 tons daily of silicious ore from the upper workings, and it is the intention to open the lower levels and extend the drifts into virgin ground to open the large bodies of ore there.——To the east and southeast in the ground of the Battleboro is a body of ore and drifts are being run from the shaft in both directions to open the ore channel. This is a separate shoot from the one at present being worked near the shaft.——The Favorite, Little Ellen and Izard are shipping 25 tons daily of iron and copper sulphide.

Summit County.

(Special Correspondence).—The Jessie mines in Gold Run, two miles northwest of Breckenridge, have been leased to J. T. Hogan, who has formed a company to work the Jessie. The 40-stamp mill is to be repaired. Mr. Hogan is general manager, F. Gilbert superintendent, and D. H. Lawrance, of Breckenridge, consulting engineer. The Jessie mine has over eight miles of underground workings and a record of $2,000,000. It is a gold mine, but in places produces high-grade silver-lead ores. The values are saved by amalgamation and concentration.——The Country Boy mine, on Nigger Hill, 1½ mile from Breckenridge, is being worked under lease by the Lanyon Zinc Co. with H. S. Clark in charge. A body of zinc ore has been opened up by a drift on the vein intersected by the main tunnel. This tunnel is 1,350 ft. long and intersects five other veins. The vein is two feet wide.——The Sallie Barber, another zinc property, near the Country Boy, is producing six cars of high-grade zinc ore per week. It is operated by a Leadville Syndicate.——The Little Sallie Barber adjoining is also making a steady production. A. W. Phillips owns and operates the group.——The Wellington mine is shipping steadily, the last shipment being of zinc ore.——In the Old Union mine high-grade silver-lead ore is coming in in the raises above the main tunnel. A 100-ton shipment of zinc concentrates has been made, and the iron and lead concentrates continue steadily.

Breckenridge, Feb. 12.

Teller County.

The Henry Adney, at Cripple Creek, is operating a 20-ft. vein on the 500 level. The shaft is sinking to the 600-ft. level.——The Gilpin Leasing Co., working the Jerry Johnson on Ironclad hill, is shipping most of the ore coming from the 450-ft. level. The company is prospecting at a depth of 550 ft. The orebody proper at both the 450 and 550 levels is widening, and on the lower level has increased to about three and one-half feet.

F. G. Horner, a miner employed at the Portland, was arrested early in the week as he came off shift, charged with high-grading. Horner is confined in the Victor jail and a deputy sheriff and an officer from Victor are in search of two other men who are alleged to be implicated in thefts of high-grade ore. Horner, the police believe, is the leader of a gang of high-graders.

Good ore has been struck by Heaton & Gorman, lessees, in the southern section of the Granite claim, on the south slope of Battle mountain, in an old shaft. At a depth of 100 ft. a vein was followed. In a short distance a stringer was encountered, which led to a shoot. The body is three to five feet wide and assays $60 per ton.

The committee in charge of the new Cripple Creek drainage tunnel, to unwater the mines to a depth of 1,100 ft. below the present drainage tunnel level, is incorporating. The papers will be filed with the Secretary of State some time during the present month. It is reported that the committee in charge of the tunnel project and of raising the necessary funds has been suc-

cessful and has completed details for the placing of the stock of the Tunnel Company with the various mining companies.——Several new leasing companies have filed articles of incorporation to operate in Cripple Creek district, as follows: The Ironclad Mill Co., with a capitalization of $16,000, to exist for a period of 20 years. The incorporators, who are also the directors of the company for the first year, are F. D. Prettyman, F. C. Whitehouse, B. H. Lein, J. B. Truitt and W. M. Truitt. Chief place of business and main office is Cripple Creek. The company has acquired the smaller of the two mills of the Homestake Co., on Ironclad hill, where it will treat ores from the Ironclad and Magna Charta claims, on which it holds a lease, and at the same time carry on a custom business. The mill is now undergoing repairs and new mill machinery will be added to the plant. The mill will be ready by March 1st. The Union Leasing Co., incorporators R. S. Husted, C. S. Tyler and C. W. Jackson, is capitalized at $40,000. The directors for the first year are C. H. Kittredge, J. D. Husted, J. H. Morse, W. F. Littell and the incorporators named. The company is to operate leases in the Cripple Creek district. Four leases have already been secured in different sections of the camp, the most prominent being on the Fountain Valley claim of the Banner Gold Co., on the west slope of Beacon hill, close to El Paso Consolidated Co.'s mines. A rich strike was made on the Fountain Valley claim in December.

The Mines Leasing Co., incorporators W. L. Jameson, A. Moore Berry and W. H. Person, who, together with W. B. Cannon and W. A. Weber, will form the directorate for the ensuing year, has been organized.

IDAHO.

Blaine County.

The Boyle Mountain Zinc mines, near Hailey, have been closed owing to disagreement between the lessees and the owners.

Boise County.

A carload of machinery is at Emmett for the Whitman Mining Co., at Pearl. The shipment includes an electric motor, compressor, receiver, air-drills, and piping and connections.

Idaho County.

The O. & E. Mining & Milling Co. is driving a long tunnel at Whitebird to cut the main ledge. The tunnel is now in 700 ft.——Work has been resumed on the Blue Jacket mine in the Cook's Corral district, near Whitebird.

Kootenai County.

The Marguerite Mining Co. has let a contract to J. C. Judge, for 50 ft. of tunnel on the Marguerite mine, near Hope.

Nez Perces County.

Jellum & Jones say that they will have a 50-ton mill in operation on their property, near Pierce City, by Sept. 1st. They are now working two shifts on the drifts at the Gold Dollar mine.

Owyhee County.

J. J. Bennet of the Delamar mill, at Delamar, states the re-construction of the mill will be completed before the end of March. Chilean mills have re-placed rolls in the old plant. Cyanide will continue to be employed to a certain extent.

Shoshone County.

The new 250-ton mill of the Hercules mine has been in steady operation since the first of the year, and is turning out concentrates at the rate of about 30 tons a day. The mill feed is composed of about equal quantities of carbonate and low-grade galena ore, the ratio of concentration being eight tons into one. The coarse concentrates average 55% to 60% lead and over 40 oz. of silver to the ton, and the fine concentrates from 40% to 45% in lead and 30 oz. in silver. The mill is so constructed that its capacity can easily be doubled, and this will probably be done during the coming summer. It is connected with the mine by tramways, and will later on be connected with the railway in the same way. A new and larger compressor will also be installed at the mill for the new No. 4 tunnel, now in 1,000 ft. It is to be 4,000 ft. long and will give 750 ft. of new backs.

Owners of the Hercules mine, at Burke, have arranged to build a tramway from the Hercules mill to ore bins on the Northern Pacific Railroad.——Bannister & Co., who last year operated a jigging plant on Canyon creek, in the center of Wallace, are to remove the plant to a site above the Federal mills at Wallace.——The Alma Mining Co. is extending its crosscut at Deadman gulch, near Mullan, to cut the main ledge.

Washington County.

The Iron Springs Consolidated Mining Co. has completed its cyanide plant on Rapid river near Weiser, and will begin operations in April on ores from the Washington, White Rose and Jim Blaine mines.

MICHIGAN.

The estimated output of the Ahmeek for January is 330,000 pounds, an increase of 74,000 pounds over that of the corresponding month of the preceding year; of the Calumet & Hecla, 7,400,000 pounds, an increase of 600,000 pounds; of the Tamarack Mining Co., 900,000 pounds, a decrease of 730,000 pounds; of the Mass Consolidated, 320,000 pounds, a decrease of 10,000 pounds; of the Isle Royale Copper Co., 240,000 pounds, an increase of 10,000 pounds from that of December; the Osceola Mining Co., 2,800,000 pounds, an increase of 300,000 pounds from that of December; of the Champion Mining Co., 2,094,000 pounds, an increase of 380,000 pounds over that of December; and of the Baltic Mining Co., 1,538,000 pounds, a decrease of 102,000 pounds from that of December.

MISSOURI.

Jasper County.

The Crellar & Young mine, on their 80-acre lease at the Four Corners, northwest of Joplin, is proving to be a rich one. They recently sold two carloads of ore and had three left in the bins. They are working at 116 ft. and are cutting a drift at the 130-ft. level. The mill is crushing a ton an hour. The Gouverneur Mining Co., operating on the same lease, has made a strike at a depth of 80 ft.——La Paloma Zinc Co., of Joplin, has filed articles of incorporation, with a capital stock of $10,000.

MONTANA.

Beaverhead County.

John F. Cowan and others are preparing to sink a shaft on the Iron Mountain mine, near Argenta, which they have recently bonded.

Broadwater County.

The Custer Mining Co. of Winston has begun sinking two shafts on its property.——Bert Lanning has completed crosscutting at the Full Moon mine, seven miles southwest of Winston.

Granite County.

The Hope mill, at Phillipsburg, has been hung up indefinitely. It is stated that the old mill is in need of extensive repairs. The old stone walls are said to be unsafe and would fall were they not braced and held together with timber. A number of men have been laid off at the Hope mine, but miners will be kept prospecting new ground. It is reported that ore will be shipped to Butte smelters.

Jefferson County.

J. L. Malm is building a plant at Corbin to treat the zinciferous ores in that district.

Lewis and Clark County.

C. R. Spicer is putting in a 50-ton concentrating plant near Austin, and expects to have it in operation by May 1st.——John Pollander has completed his crosscut tunnel on the Dread Naught.——Skelley, Goudy & McDonald have completed a drain tunnel on their ground in St. Louis gulch, near Austin.——W. Cunningham is sinking a winze on the Kate Roddy mine on Greenhorn gulch, west of Austin.——J. Larson, of Marysville, owner of the tailing dump at Bald Butte, has arranged with A. Constance, of Unionville, to treat the 70,000 tons in the dump by cyanide process. The dump is said to average $2.25 in gold per ton.

Park County.

The mill at the Revenue mine at Jardine has shut down for 40 days for the installation of new machinery.

Silver Bow County.

(Special Correspondence).—The East Butte mines are yielding 100 tons of ore per day, although five shafts are idle, including the Dutton and Geyman, on which extensive repairs and improvements are being made. The mines of the company in operation are worked entirely by leasers. In No. 2, one set of leasers has struck a body of ore that they are sacking in the mine. The ore runs 42% copper, 65 oz. of silver, and some gold to the ton. The concentrator has been remodeled and provided with new machinery. The plant will now save 85% of the mineral, where it could formerly save but 50%. Work will shortly be resumed in the Geyman, which has been repaired and cleaned up. The vein is 60 ft. wide, with six feet of first-class ore.——The findings of Oliver T. Crane, master in chancery for the United States Court, in one of the numerous damage and injunction suits against the Washoe and other smelters at Butte and Anaconda, is one of importance to mining and smelting companies, as it practically establishes a rule against injunctions to prevent the operation of smelters. The farmers of Deer Lodge valley have combined in suits against the smelters, and for several years the industry of 'settling with the company' has been more important to the ranchers and stockmen than raising crops or cattle. They claim that their lands have been damaged by acids, etc., discharged into the irrigating streams by the smelters, and that their live stock has been killed by the same poison and by smelter fumes. Judge Crane finds that the smelters and mines were here long before the ranchers were, and that the damage being done agriculture is insignificant when compared with the damage that would be done by closing the mines and smelters, which represent more than one hundred million dollars of property and invested capital, and furnishes employment and support for 20,000 men, and indirectly many thousands more, besides being the sole support of the cities of Butte, Anaconda, Belt and other communities. Judge Crane finds that the rancher in whose case the findings were made was damaged, but that the companies responsible for it are solvent and able to respond in damages for all injuries that have been done or may be done in the future.——The Calumet & Butte Co., organized in Michigan by Calumet men, has acquired several claims on the east side of the Butte district, near the Pittsburg & Montana Co., and preparations are making to develop the property.——The Gagnon mine of the Trenton Co., one of the Amalgamated sub-companies, has been shut down to re-timber the shaft between the 1,000 and 1,300 levels. The mine will be closed for six weeks. Meanwhile, the Trenton Co. will produce nothing.——The Never Sweat mine of the Anaconda Co., which was shut down for repairs for several months, has resumed operations.

Butte, Feb. 12.

The Raven Copper Co., of Butte, is driving a crosscut from the 1,200-ft. level of the Buffalo toward the Snoozer mine.

W. A. Clark has ordered Manager A. H. Wethey of the Butte Reduction Works at Butte to arrange for the re-building of the concentrator destroyed by fire last week.

NEVADA.

Esmeralda County.

(Special Correspondence).—Fish Lake valley, in and about Dyer, is 25 miles south of Coaldale, a station on the Tonopah Railroad. Considerable work is in progress, and there are many good-looking prospects, with ledges three to five feet wide, running from $10 to $25 per ton. The Lookout is the principal mine thus far. It is equipped with a 25-h. p. steam hoist and working 20 men. The company has lately placed a contract for a 10-stamp mill, pumping and cyanide plant.——Adjoining the Lookout, the Esmeralda has recently been bonded. They have a shaft down 100 ft., showing good ore. Last week float was found which gave assays from $150 to $256 per ton. Efforts are being made to find the ledge. —— There is an assay office seven miles south of Dyer, at McAfee ranch.

Dyer, Feb. 12.

W. P. O'Meara and others, who recently secured the Valcalda property at Silver Peak, are arranging to purchase machinery for a 10-stamp mill in San Francisco. Power will be secured on Bishop creek in Inyo county, California.

Suits have been commenced in the district court by the Jumbo Mining Co. against J. McKane and others for $112,000 damages for the condition in which the defendants are alleged to have left the mine at the expiration of their lease a year ago. The claim is made that the mine was left in a dangerous condition.——The Goldfield Mining Co. will put in a 50-h.p. electric hoist.——The Great Bend mine, near Goldfield, has commenced shipping ore, after opening up good sized orebody running about $40 per ton.——It is reported that an 18-in. vein of $100 rock has been found in the Daisy claim of the Black-Butte Extension Co., near Goldfield.——A strike was made last week in a new district, ten miles west of Goldfield and four miles south of Alkali springs, by D. C. Pomery and J. J. Sheridan, who have opened up a ledge there. They staked the Alice and the Snowshoe lodes last fall, and ever since have been prospecting the ground. A ledge three feet wide has been opened up on these claims, but the rock showed no pannings. They are driving a tunnel which will cut the ledge at a depth of 50 ft. Pieces of surface quartz assays show gold at the rate of $200 per ton.

Everett & Dungan have sunk 200 ft. on the Gold Crown mine, near Mina, and have cut into a sulphide zone.——A gasoline hoist for the Griggs-Atwood mine, near Mina, has arrived.——All the equipment for the Vulcan Copper Co. has been purchased by the Blue Light Mining Co., to be installed on the Blue Light mine, near Mina.——The hoist of the Mayflower mine, near Bullfrog, has been shipped from San Francisco.——Loftus & Davis have secured a controlling interest in the Great Bend mine near Goldfield, which will be equipped with gasoline power.——The Highland Boy Mining Co. has bought the Silver Summit lead-silver mine, near Sodaville.——The owners of the La Pauta mines, near Hawthorne, have sunk a shaft 300 ft. and are crosscutting to the vein. A steam hoist is to be installed.

Humboldt County.

L. P. Helmer has sold a half interest in the Mill City and Good Hope claims, at Mill City, to E. M. Schaad of San Francisco. The company is putting in a pump and engine and is laying tracks. A mill will be built later.

Lincoln County.

Mr. Lloyd, at Modena, has let a contract for freighting 50,000 tons of mine timbers to Pioche, Nev., via Modena, and for loading back to Modena with ore at one-half cent per pound.——C. B. Sibert, of Caliente, is figuring on a mill for the reduction of free-gold ores at Caliente, and plans to begin operations by the first of June.

Nye County.

The Ridge & Curtis mines, at Gold Crater, are reported sold to the Nevada-Crater Gold Mines Co. for $55,000. A 50-ton shipment was recently made to the Goldfield mill which is reported to have netted $40 per ton.

The Golden Sceptre is sinking a shaft on ledge No. 2, an extension of Gibraltar ledge No. 2. The talc streak, which was struck in the shaft at 15 ft. depth, is six inches wide and assays well. The rest of the shaft is in quartz which pans. Fifteen men are working two shifts on both the upper and lower tunnels.——At the Valley View group of the Gold Center Mining & Development Co., north of the Pioneer, a ledge between well-defined walls has been discovered crossing from the Zu-Zu claim, on which a shaft will be sunk.——The Tramp No. 1 and Tramp Extension, on the south slope of Bonanza, owned by Oddie, Aldrich and others, is being developed by Superintendent Lester. The shaft is down 38 ft. and the tunnel has been driven 30 ft. Good values are found in the shaft. The tunnel was started on a large body of ore.——The strike on the Aurora of the Bullfrog Mining Co., 10 miles north of Bullfrog, is reported to be improving. It is important, as it extends the known mineral area of the district. The ledge on the Aurora on the surface is said to be 56 ft. wide. It is traced for 3,000 ft. on the company's ground and continues on other property. Surface values averaged a little better than $4. The orebody has been cut in the tunnel, which is in 155 ft., at a depth of 70 ft. The first assay went $381, when the ledge was intersected at the hanging wall. The average across the first four feet went $38.45 to $88.——The Mayflower shaft is down 100 ft. and crosscutting has been commenced. The average across the bottom of the shaft runs $30 per ton gold and a small amount of silver. At a depth of 40 ft., where the ledge was found to be over 10 ft. wide, the average was $30 per ton. On the foot-wall talc showing free gold was found. A 25-h. p. hoist will be put in.——The big Eclipse tunnel is in 415 ft., and will reach the ledge by 200 ft. additional driving. The tunnel is cutting a dike of rhyolite, which contains low-grade ore. The rock is very hard, and only two feet of work are being accomplished with three shifts.

The Goldyke Reef Mining Co. is putting in a 10-stamp mill for its mine at the new town of Goldyke, near Tonopah. The owners of the mine are now crosscutting and drifting.——The North Tonopah Mining Co. is sinking a shaft on its ground near the new town of Manhattan.

Ormsby County.

The Selby group of claims in the Jumbo district, six miles north of Carson, is to be equipped with a mill.

NEW MEXICO.

Grant County.

Unwatering of the North American mine at Lordsburg has been completed and sinking resumed to reach a depth of 500 ft.——The Bonney Company has closed

down the Bonney mine near Lordsburg, owing to unsafe condition of the hoist at the main shaft. A new hoist is to be installed.——The International Gold Mining & Milling Company has suspended work.

A rich strike of copper ore is reported seven miles west of Lordsburg by two cattlemen. Two months ago V. P. Harrington purchased from J. Robinson a ranch. Harrington's brother, J. L. Harrington, in rambling over it, noticed a ledge of rock that looked ore bearing. After going down 12 ft. on what they presumed to be a vein, a sample across the ledge carried 41% of copper. They located 10 claims and will begin development work. The vein is two feet wide at the surface and at the depth of 12 ft. is 40 in. wide. The property is one mile from the Southern Pacific.

A cave-in of a hill of slag at the Comanche smelter at Silver City buried the briquetting plant of the company and damaged the machinery, which has delayed the blowing in of the new 250-ton furnace. This company will put in three additional boilers and an electric generating plant.——W. R. Jackson will build a 50-ton concentrator on his claims, near Silver City.

Lincoln County.

An 80-h. p. steam hoist and an air compressor will be installed at the Honey Bee copper mine at Jacarilla by E. Fox, the new owner, who will also contract for 300 ft. of development work on the Hawkeye mine, in the same locality.

Otero County.

The owners of the Monte Carlo group, at Jarilla, have let a contract to sink a new shaft.

Rio Arriba County.

Work has been resumed on the shaft of the Minneapolis mine at Bromide.——R. Cole is sinking to the 300 level on the Sardine mine at Bromide.

Sierra County.

A 40-h. p. gasoline traction engine and a number of dump cars have been received by the Sierra Consolidated Gold Mining & Milling Co., near Lake Valley.——The three-compartment shafts at the Snake mine, near Hillsboro, now down 180 ft., is being equipped with pumps.——A 40-h. p. gasoline engine and hoist have been ordered for the Opportunity mine, at Osceola, near Lake Valley. The company will erect a 250-ton stamp mill.

Socorro County.

The Graphic Mining Co., operating the Graphic mine, near Kelly, is preparing to drive the main tunnel, now in 1,200 ft., 800 ft. further.

Taos County.

A 300-foot tramway is being laid at the Stella mine, near Red river.——Kelly Bros. have cut the lead at the Blue Rock mine, near Red river, after running a tunnel 100 feet.

OREGON.

Baker County.

Manager McCarthy, of the Golconda mine at La Grande, is remodeling the mill at the mine, installing new concentrators, and adding an automatic sizer. Two 500-ton ore bins are being built, replacing the 60-ton bins.——The owners of the Ophir mine have decided to install a hydro-electric power plant at Baldy Lake to furnish light and power for the Ophir, Sheridan and other mines at Cable Cave, 15 miles from Sumpter.——Manager G. W. Boggs, of the Mayflower mine, in Cornucopia district, 60 miles east of Baker City, is completing his cyanide plant. Sixty thousand feet of lumber have been taken in over the snow.

M. A. Dehuff, manager of the Dames Mining & Milling Co., reports that a 20-stamp mill will be installed on the company's property at Greenhorn in the spring.

L. V. Swiggett, manager of the Golden Chariot group, in the Bear Creek district, two miles east of Sumpter, has returned from the East and says development will be resumed as soon as machinery is received. A three-drill compressor will be put in, as well as extra buckets and cables. The main shaft is sunk to 200 feet.

Grant County.

The roof of the stamp mill at the Equity mine, near Comer, collapsed last week, owing to the weight of snow that had accumulated on it.

Josephine County.

The Briggs Gold Bar Mining Co., owning property on the California line, near Grants Pass, have purchased machinery for a 20-ton mill. A sawmill is en route to the mine. The principal tunnel of the mine is in 200 ft. and drifts are being run.——L. B. Wickersham, superintendent of the Granite Hill mines, at Grants Pass, reports that the conversion of the machinery from a steam to an electrically operated plant has been completed.

Contracts have been let for the further extension of the lower tunnel, at the Mountain Lion mine, at Davidson.

Union County.

The management of the Indiana mine, at Medical Springs, say that crushing, concentrating and smelting machinery to treat 100 tons daily will be installed in the early summer.

SOUTH DAKOTA.

Pennington County.

The American Tungsten Co., owning claims near Hill City, are considering the building of a concentrating plant to treat ores carrying wolframite and tinstone.

The Montezuma Mining Co. at Rochford is preparing to operate its property. The company patented part of its ground, and surveyors are platting five more claims preparatory to patenting them. The company has installed an air compressor and two drills.——Operations are to be commenced on the old Standby, near Rochford. Men are repairing and putting a new roof on the mill and fixing the flume.

The Golden West mill, six miles west of Rochford, will be increased in capacity, according to Manager E. J. Kennedy, who says that all details have not yet been arranged. The Golden West is a low-grade mine. Last year 10,000 tons of ore were handled, the season being limited, as the mill is operated by water power.

UTAH.

Juab County.

F. W. Sherman, superintendent of the Daly-West mill at Park City, will instal his ore-dressing devices in the mill to be built by the Yankee Consolidated Mining Co. in the Tintic district. He will also have charge of the construction of the plant.

Manager G. H. Dern, of the Mercur Consolidated, in Camp Floyd district, says the average put through the mill in January was 900 tons per day. Development has been carried along vigorously and satisfactorily. In what is known as raise 80 a large body of ore has been opened and, for over 100 ft. that has been drifted, shows an average width of 20 ft. In raise 174, another body of ore has been opened, from 8 to 15 ft. wide. The vein was cut 500 ft. deeper than where it was exposed in the old workings.

Salt Lake County.

The Red Wing and Butler-Liberal, recently taken over by the former together with the Utah-Apex, will form another combination of Bingham properties. W. C. Orem is perfecting the local arrangements for this change in affairs.

Farmers in the vicinity of Sandy, among whom is John W. Mackay, of Taylorsville, have filed additional suits against the Utah Consolidated, United States and Bingham Copper & Gold Mining companies for damages to the amount of $30,572.82 resulting from smelter fumes.

Summit County.

J. E. Bamberger, president of the Daly West Co., says of the reported Daly West-Ontario sale that there is no foundation for the report that an option had been secured.

In sinking at the St. Louis-Magnolia property, near Park City, Wednesday, at a depth of five feet, a streak of high-grade galena ore was encountered.

Manager Oscar Lawrence of the Jupiter states that there is enough ore in sight to insure shipments for some time to come. In the spring the working force will be increased and mining on a larger scale commenced.

WASHINGTON.

Chelan County.

The Wenatchee Gold Mining Co. will extend its tunnel, six miles from Entiat, several hundred feet to the main vein.

Ferry County.

(Special Correspondence). — The Belcher Mountain Railway Co. has arranged to remove the rolling stock for its road and machinery for the Belcher mine to the company's own track and to the Belcher mine. —— In the Copper Key mine, on No. 2 tunnel level, drifts are being steadily driven north and south on the vein. A raise of 20 ft. is in ore. On this level another raise of 22 ft. has not reached the vein. Teams have been engaged to haul ore.——At the Ben Hur additional power drills have been put in the past week on the 300-ft. level. The week's shipments have not exceeded 15 tons of ore a day.

The new machinery at the Pearl Consolidated mine is being installed. A crosscut has been driven to the vein west on the level 100 ft. below the adit, which has struck ore. The east drift on the vein is in 100 ft. and the ore is improving in quality. Eighteen men are employed. ——An improvement has been noted the past week at the Phil Sheridan, at Sheridan camp.——The tunnel at the Hawkeye is in 269 ft. and is expected to strike the vein in a few days. This property is north of Lambert creek.——Ore is being sacked for shipment at the Mountain Boy, at Park City, reported to carry 1,000 oz. of silver to the ton.

Republic, Feb. 9.

The electric drills on the Belcher mine, near Republic, are in operation.——The machinery for the Minnehaha mine, near Danville, is now being installed.——The shaft on the Ben Hur mine, at Republic, is down 119 ft. and drifts are being driven.——Machine drills are to be installed on the Winnipeg tunnel, in Belcher camp, near Republic, to be operated by electricity.——The Straight Mines Co., operating the Anonymous group, on Belcher mountain, near Republic, are arranging to start a tunnel to cut the ledge at a depth of 600 ft. as soon as the snow goes off.

The owners of the Defender mine, at Orient, will sink the shaft, now down 60 ft., to 300 ft.

Kittitas County.

A. S. Randall, secretary of the Skookum Copper Mining Co., of Roslyn, operating property at Cle Elum, states that a plant will be installed at the mine as soon as the roads are open in the spring.

A carload of mining machinery has arrived at Cle Elum for the Helene Mining Co.

Okanogan County.

The Great Northern Mining Co., operating on McKinley Mountain, near Winthrop, on the Methow river, has let a contract for driving a 50-ft. extension of its tunnel, now in 350 ft. Work on the mine will begin March 1.

Snohomish County.

Bids are asked for a 100-ton concentrator, to be installed on the New York-Seattle Copper Mining Company's property at Index. A raise is now being driven from the 330-ft. level to the surface to provide air and to open stoping ground.——The Bunker Hill Mining & Smelting Co. is running a tunnel and opening stopes on the 1,000-ft. level at its mine near Index. A half-mile flume connecting the concentrator with the Great Northern Railway has been completed.——The Buckeye Copper Co. has arranged for machine drills on the 900-ft. level of its mine near Index.——Rowland & McAllister, operating the Ethel mine, near Index, are running to raise from the lower to the middle tunnel.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

At a meeting of the Dundee Mining Co., held recently in Everett, Wash., T. B. Sumner, H. R. Dougless, H. D. Cooley, J. F. Deiericin and W. D. Clark were elected to the board of directors. The company expects to resume operations on the property, located at Nelson.

Boundary District.

The British Columbia Copper Co. has awarded contracts for three blast furnaces for its plant at Greenwood. The new furnaces will be larger than any heretofore used in Canada. In the spring the company will remodel its plant and instal electrical equipment. Electrical equipment will also be put in at the Emma mine, in Summit camp.

MEXICO.

Chihuahua.

The Los Angeles Mining Co., of Los Angeles, in the Guadalupe district of Chihuahua, will build a 10-stamp mill, foundations for which are under way.

Coahuila.

Luis Lyon, of the Cia Minera de Los Santos, reports that heavy rains of the past few weeks have interfered seriously with operations of the company's mines at Villadama.

Durango.

According to W. S. Morse, general manager of the American Smelting & Refining Co., the Velardena smelter was to have been ready for blowing in by April, but owing to the scarcity of labor it will hardly be ready before July. The concentrating mills and plant secured from the Velardena Mining & Smelting Co., under which name they are still known and operated, have been largely increased in capacity. Trams and ore-carriers have been installed and the power plant improved. The new smelter at Velardena will have a capacity of 2,000 tons daily.

El Japon y Annexas, owners of several mines in the vicinity of Guatimape, in this State, have completed sinking a large shaft and are preparing to instal a cyanide plant to treat ores running less than 2 kilos per ton.

Guerrero.

The Garduno Mining Co., of Mexico City, is preparing to work extensive placer claims on the Rio del Oro in this State. The deposits lie between Los Cajones and Zirandero. They will be worked by dredgers and hydraulic lifts.

Saltillo.

The Mazapil Copper Co. reports the arrival of 16 carloads of machinery at its mine, near Saltillo.

Sonora.

A. Menger and C. Cervante, of Tucson, Ariz., have been investigating a discovery recently made 15 miles from Salina Port, on the Gulf of California, and 65 miles northwest from Altar, and have bought the same. The ore is conglomerate. A shaft sunk 50 ft. is all in ore and a crosscut is in ore, some of which is rich, the free gold showing. The ore will be shipped.

Books Received.

'The Copper Deposits of the Clifton-Morenci district, Arizona' is the title of professional paper No. 43, by Waldemar Lindgren. This is one of the most important contributions to geology and economic mining that has been issued during the past year. The author takes up the history, climate, and literature of the district, all of which is interesting, to even the casual reader. Them are described the general geology, the various ore deposits, the metasomatic processes, resulting in ore deposition, characteristics of the deposits, and of the several districts. The subject is treated in a most exhaustive manner, and is profusely illustrated with half-tone engravings, sketches, maps, etc. To those interested in copper mining this treatise, although of but a local district, cannot fail to be of great interest and value. may be obtained by application to the director of the United States Geological Survey, Washington, D. C.

The twenty-sixth annual report of the director of the United States Geological Survey, just received, is a comprehensive presentation of the accomplishments and present condition of this branch of the government service. It is not dissimilar from other similar reports of recent years, though by comparison with the earlier reports, a wide difference is observable. One interesting feature is the insertion of maps showing the progress being made in the preparation of the geological atlas of the United States. Considerable space is also devoted to the hydrographic branch and reclamation projects. The work allotted to the several field parties is reviewed, and results accomplished stated. The survey is divided into several departments for the more economical and satisfactory conduct of the work. These are the administrative, geologic, topographic, hydrographic, and publication branches, and the reclamation service. Those interested in the work of the survey can obtain copies of this report by addressing the director of the United States Geological Survey, Washington, D. C.

The value of a book is determined for the individual by himself, his knowledge and needs being the determining factors. A mining man examining a 'Handbook of Cost Data' by Halbert P. Gillette will be disappointed if he expects many data on the actual costs of the class of work he may be doing. But, if he desires advice as to how to keep cost data, how to decrease his own costs and how to gain more efficient service from labor, he will be well repaid by reading the introductory chapters on costkeeping, preparing estimates and organization of forces. The book details costs for thirteen classes of construction, including earth excavation, rock excavation, roads, stone masonry, concrete, water-works, sewers, piling, buildings, railways, bridges, surveys and

miscellaneous structures. All of these subjects are treated in a little over 500 pages, of which but 35 are devoted to rock excavation, quarrying and crushing. Two-thirds of this is of but little value to the miner. This criticism is not intended to be captious. The book is written for a purpose and it fills that purpose admirably. Contractors and constructing engineers are given a guide for the preparation of estimates that probably has never been equaled. The very dearth of information on the costs of metal mining but emphasizes the demand for a book devoted to that subject alone. It is to be regretted that so few data have been presented as to Western costs which differ from Eastern, because of different conditions of material, transportation and labor. Other sections of the book are more complete. Their arrangement is logical and adpated to quick reference. It gives all possible details of cost and defines the conditions of such cost. Beyond this it shows how to analyze costs and indicates the best methods for economical work. It is published by the Myron C. Clark Publishing Co., 13-21 Park Row, New York, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $4.

Personal.

THOS. H. LEGGETT is now in London.

JAS. W. NEILL is at Pasadena, California.

W. B. MILLIKEN, of Denver, is in Nevada.

ALBERT BURCH is examining mines in Utah.

SAMUEL R. PORTER, of Los Angeles, is in Mexico.

NICHOLAS TREWEEK, of Salt Lake, is in New York.

C. S. PAINE, of North San Juan, is in San Francisco.

J. C. NIVIN, of Bellevue, Idaho, is now at the Palace Hotel.

W. F. BLAIR, of Chicago, and a mine owner, is visiting California.

WALTON E. DOWLEN has arrived at Goldfield, Nevada, from Paris.

G. D. B. TURNER has returned to Utah from southern California.

EDWARD D. DOWLEN has left San Francisco and is on his way to London.

LEWIS SEARING, of the Denver Engineering Works Co., is in New York.

WILLIAM B. FISHER has been on a visit to San Francisco, from Wallace, Idaho.

L. J. W. JONES is smelter superintendent of the Tacoma smelter, at Tacoma.

THEO. L. LAMMERS will be in Nevada making mine examinations until March 1.

HENRY McW. BOURKE, who visited California on his way home, is now in London.

HENRY DE C. RICHARDS has been examining mines in Amador county, California.

JOHN BIRKINBINE has been elected president of the Franklin Institute, Philadelphia.

WALTER E. TRENT sailed on the *Sonoma* for Sydney, on his way to Queensland, Australia.

HORACE V. WINCHELL, of Butte, is taking a short rest at the Del Monte Hotel, Monterey.

J. H. RICKARD has been appointed manager for the Djebel Charra Mining Company, in Tunis.

B. H. BENNETTS is superintendent of the big smelter in course of construction at Garfield, Utah.

MARK B. KERR has gone to Tonopah to act as consulting engineer for the West End Mining Company.

F. W. NEWTON is superintendent of the National Mining Company's property at Stein's, New Mexico.

JOHN ROSS, JR., manager of the Wildman Syndicate, has returned to Sutter Creek from San Francisco.

E. J. KENNEDY, superintendent of the Golden West mines, near Rochford, South Dakota, is at Chicago.

WM. WILLIAMS, a pioneer of Wallace, in the Cœur d'Alene, is visiting that district, after a long absence.

E. WILDER, of Kansas City, and J. C. FARRINGTON, of Topeka, have been inspecting mines at Globe, Arizona.

L. W. POWELL has assumed the management of the Calumet & Arizona Company's mines at Bisbee, Arizona.

D'ARCY WEATHERBE, of the editorial staff of the MINING AND SCIENTIFIC PRESS, is now in British Columbia.

J. K. FIRTH has associated himself with the mining machinery department of the Fulton Iron Works, of San Francisco.

MARTIN SCHWERIN, of New York, was in San Francisco on his way from Oregon. He will visit Virginia City before returning home.

EDGAR RICKARD, business manager of the MINING AND SCIENTIFIC PRESS, has started on a visit to Denver, Chicago and New York.

ARTHUR H. HALLORAN, of the editorial staff of the MINING AND SCIENTIFIC PRESS, is visiting the mining centers of Utah and Montana.

JAMES DOUGLAS has been elected an honorary member of the American Institute of Mining Engineers, in recognition of his services to education and to industry.

JOHN T. HARRINGTON is temporarily in charge of the Kearns-Keith mine, near Park City, Utah, during the absence of the superintendent, P. HURLEY, at San Francisco.

J. M. NISSEN, of the Nissen Engineering Company, of Los Angeles, is now in Tepic, Mexico, installing machinery for the Lacy Manufacturing Company, of Los Angeles.

WARNER MILLER, of New York, president of the Dominion Copper Co. (Ltd.) of Phœnix, B. C., and M. M. JOHNSON, of Salt Lake, consulting engineer for the company, are at the mines, guests of T. R. DRUMMOND, resident manager, at Phœnix.

E. E. NICHOLSON was wrongly described as recently foreman of the Granby mines; he occupied that position with the Sunset mine in the Boundary district of British Columbia. Mr. Nicholson is now superintendent of the Carrizo Copper Co. at Autlan, in Jalisco, Mexico.

Latest Market Reports.

SAN FRANCISCO, February 15, 1906.

ANGLO-AMERICAN SHARES.

London, February 15, 1906.

	£	s	d		£	s	d
Camp Bird	1	8	7½	Oroville Dredging	1	1	3
El Oro	1	6	10½	Stratton's Independence	0	7	9
Esperanza	4	7	6	Tomboy	1	7	6
Dolores	2	0	0				

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. February 15, 1906.)

Amalgamated	$113⅛	North Butte	$ 86¼
Anaconda	279	Old Dominion	41½
Bingham Copper	42¾	Shannon	6
Daly West	16	Tonopah-Nevada	18⅜
Granby	9⅞	United Copper	70½
Greene Consolidated	26¾	United States	57½
Nevada Con. Copper	14¼	Utah Copper	32¼

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 35	Ophir	$5 37½
Hale & Norcross	0 79	Potosi	0 10
Mexican	1 20	Savage	0 37
Exchequer	0 42	Yellow Jacket	0 10

[Tonopah and Goldfield.]

Belmont	$3 50	Montana-Tonopah	$2 92½
Golden Anchor	1 50	Ohio-Tonopah	0 47
Jim Butler	1 05	Red Top	1 90
Jumbo	1 70	Sandstorm	1 40
Kendall	0 82	Tonopah Ex	11 37½
Midway	1 90	West End	2 50

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 66⅜c. per fine ounce; San Francisco, 66⅜c.; London, 30 1/16d. (standard ounce, 925 fine); Mexican dollars, 51@53c., San Francisco; 51c., New York.

COPPER.—New York (by wire, average for week ending Feb. 15), Lake, 17.75@18c.; Electrolytic, 17.62@17.87c.; Casting, 17.50@17.62c. per pound. Mill copper plates, $21.00; bars, 21@24c. London: £78 spot per ton.

LEAD.—New York (by wire, average for week ending Feb. 15), $5.55 per 100 lb; San Francisco, pig, 6.55@6.78c. per lb.; pipe 8@8½c.; sheet, 9@9½c.; London: £15 15s. ℔ long ton.

SPELTER.—New York (by wire, average for week ending Feb. 15), $6.05@6.10 ℔ 100 lb.; London, £25 15s. ℔ ton; San Francisco, ton lots, 7c.; 100-lb lots, 7¾c.

TIN.—New York, pig, $36.40@36.70; bar tin, ℔ lb., 42½c.; pig, 39c. London, £167.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$41.50, large lots; London, £7 7s 6d.; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 33@37c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.50; gray forge, $17.25; San Francisco, bar, 3½c. ℔ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00 open hearth billets, $27.50; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8½c.; less than 500 lb., per lb., 8½c.; in 25-lb. tin pails, ½c. ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ½c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8½c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 14c@15c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8½c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11¾c; 14 oz., 10@10½c; 12 oz., 9½@9½c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6½@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17c; Astral, 17c; Star, 17c; Extra Star, 20c; Eocene, 19c; Elaine, 26c; Water White, in bulk, 10½c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24½c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 15½c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 65c; cs., 70c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 53c.; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 57c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—98@99% N. Y., $1.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lb. and over at one purchase, ℔ lb., 8½c.; less than 500 lb., 8½c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., 90c.

URANIUM.—Oxide, ℔ lb., $3.40.

Commercial Paragraphs.

MR. L. F. BOWER has been appointed comptroller of the Allis-Chalmers Co.

THE general offices of the Ludlow-Saylor Wire Co. have been removed to Fourth and Elm Sts., St. Louis.

THE Westinghouse Machine Co. have opened a Philadelphia sales office in Room 1003 North American Building.

CROCKER-WHEELER CO., of Ampere, N. J., report that their business for 1905 was larger than any year in the history of the company.

WM. ROSLINGTON, manager F. W. Braun Co., and R. L. WILLIS, of the Western Candle Co., are making a trip over the Mother Lode.

THE Jeanesville Iron Works report the complete installation of a 2,000-gal-per-min. pump on the 1,000-ft. level of the El Paso Consolidated mine, Cripple Creek.

CARY & FIELDING, 1711 Tremont St., Denver, Colo., state that they have put in a consigned stock of valves manufactured by the Wm. Powell Co., of Cincinnati, Ohio.

THE De Lamar's Copper Refining Co. has bought property at East Chicago and is now erecting a lead refinery, with a capacity of from 2,000 to 3,000 tons per month.

THE General Engineering Company, recently incorporated, with offices in the Dooly block, Salt Lake City, are prepared to test ores in large quantities and advise as to suitable methods and machinery.

THE stock of F. M. Davis in the F. M. Davis Iron Works Co., of Denver, has been purchased by T. S. Cary, R. T. Cary, W. C. Davis and T. M. Blythe, and the company will continue to offer mining, milling and smelting machinery.

Trade Treatises.

Instruction Book No. 5,000 from the Allis-Chalmers Co., of Milwaukee, Wis., tells how to set up and operate Style 'D' Gates rock and ore breaker. Incidentally it illustrates and details the construction.

Under the title of 'Hydro-Electric Plants of the United States, Canada and Mexico,' Arthur W. Clapp, M. E. E. E., 1164 Monadnock Block, Chicago, Ill., will shortly give to the electrical engineering field the first volume of an exhaustive treatment and description of the plants of over 500-h.p. capacity, in the countries covered.

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SAN FRANCISCO, FEBRUARY 24, 1906.

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EDITORIAL.

ON November 17, 1855, David Livingstone discovered the Victoria Falls of the Zambesi. Fifty years later a steel cantilever bridge was built over the falls. It was linked on April 1, 1905, and is now almost complete. The trains of the Rhodesian railroad will shortly be able to cross the Zambesi. In September the British Association for the Advancement of Science held a session at the Falls, the president being the son of Charles Darwin. The world moves rapidly, and occasionally to some purpose.

THE reminiscent article on the Comstock will prove interesting, when read in connection with the picture of Virginia City as it looked thirty years ago. It has always been a question whether the Comstock did more good or more harm to mining as a legitimate industry; the wild gambling, trickery and underhand practice of the boom days on the great lode did much to undermine the morality and reputation of mining in the West, and while the enormous output gave fame to the region and wealth to some of its people, it is a question whether, from the standpoint of these days, the good of it outweighed the bad features. One story may be told to illustrate the mingling of humor and rascality that distinguished many of the transactions of that period. The pump-rod at the Combination shaft broke suddenly; one of the men present rushed to town and telegraphed to brokers at San Francisco to sell stock. He returned after 'lunch' and, to his exceeding annoyance, found the pump running. Repairs had been made in two hours; that pump-rod was nearly 3,000 feet long and was made of Oregon pine, 18 inches square, strapped, and bolted with iron. The story balances the greed of one man against the mechanical ingenuity of another.

MINE SUPERINTENDENTS will find interest in the contribution discussing the best shape to make a shaft that is already ten feet square. Mr. R. H. Burrows submits the question in an impartial manner, despite the fact that it formed the basis of an amiable controversy with his directors. Incidentally, we congratulate a mine manager who has directors so reasonable and well-informed. The problem is one worthy of attention and we hope some of our readers will express their views upon it.

CONGRESS has voted, under an urgent deficiency bill, the sum of $25,000 for further experimental work in connection with 'black sands,' with the particular purpose of encouraging the search for platinum. Dr. David T. Day, who has directed this work, at Portland, will also arrange to send a number of young men into the field, but not at Government expense, to test placer sand for platinum, iridium and osmium. Platinum and tin are two metals for which the present demand far outruns the supply.

WHILE tin remains a scarce product of the United States, the domestic tin-plate industry, which involves the application of foreign tin to American iron, is prospering. During 1905 there were 275 mills in operation, turning out over 600,000 tons of plate. In spite of this competition, the similar industry in Wales is also prosperous, having produced 625,000 tons. Notwithstanding the tax placed on tin-plate by the McKinley tariff fifteen years ago, the Welsh mills sell freely to the United States, without spoiling business on this side.

OUR metallurgical friends will be glad to read the article on 'Pyrite Smelting Without Coke' by so practical a smelter-manager as Mr. Lewis T. Wright. It is not so long since, that, in another place, we elicited a vigorous discussion on pyrite smelting. But the subject does not grow stale; the infinite variety of conditions to which it refers gives it a perennial interest. Mine sampling, ore deposition and pyrite smelting are subjects that will continue to be with us, because they deal with basic problems. The pages of the MINING AND SCIENTIFIC PRESS will always be open to the discussion of them.

PRESS despatches have told of an active volcano in Colorado, and irresponsible scribes have appealed successfully to that love of the marvelous which is to be found in every man. Such stories of plutonic activity break out in the daily press at regular intervals. In this case, it is likely that the so-called volcano was an emission of steam from thermal springs, of which there are several at Hot Sulphur Springs, Colorado; and if not that, it may have been the burning of a coal outcrop started by prospectors desirous of testing the mineral in a simple, but very careless, manner. There are numerous seams of bituminous coal in that part of the State.

EVERYONE interested in mining throughout the West will have felt keen interest in the developments announced from Boise and Denver. If the perpetrators of the crimes that have disgraced several mining communities during the last five years—to go no further back—have been caught at last, it will be an event of the first importance. We hope the trial of the suspected men will be conducted fearlessly and fairly, and that if proved guilty their punishment will deter the perpetration of similar atrocities. In the meanwhile, we venture to say that the premature boasting of the superintendent of the Pinkerton agency can only be explained on the supposition that he desires to advertise himself. It is not seemly to talk of the suspects as already condemned by the law, and it is not necessary to brag about former most excellent service in Pennsylvania. The men who assassinated Arthur L. Collins, who instigated the Independence explosion, who led the brutal attack on the Smuggler-Union miners, ought to have been caught and punished long ago: the failure of the authorities to do so has disgraced Colorado in the eyes of all decent people; but let the detection and the punishment be undertaken, not as an incident in the feud between two parties to an industrial quarrel, nor as a private vendetta, but as the due enforcement of justice and the vindication of laws too long outraged.

Ore Flotation.

We publish a comprehensive abstract of a paper read before the Faraday Society, in London, which deals with the concentration of ore by taking advantage of those physical properties which cause minerals to rise to the surface of certain liquids. The article may seem, at first sight, to be abstruse and highly technical, but careful reading will prove that it is written with delightful clearness and it is only highly technical in the sense that it deals with a profound problem in a scholarly manner, free from the needless use of many-syllabled words. At the present time, the idea of separating sulphides from their encasing gangue by causing them to rise in a liquid under chemical action is the basis for several practical processes of ore concentration, especially at Broken Hill, in Australia, where there is an enormous tonnage of low-grade zinc-lead-silver ore, in which blende and galena are so intimately mixed as to defy ordinary milling methods. Messrs. Swinburne and Rudolf have come to the conclusion, after painstaking investigation, that the success of the processes invented by Potter, Delprat and others, as well as the oil concentration process of Elmore, is really due to the adhesion and surface tension arising from what we term capillarity. They explain their argument with admirable skill, employing simple illustrations well within the daily experience of any of us. The 'greasiness' of certain minerals is discussed, and every prospector who uses his pan to investigate his find of ore will find it interesting to read an explanation of a thing he sees so often and has probably failed to explain to himself. Only the other day we received an article in which an experienced miner theorized on the causes that made particles of gold rise to the top of the water in his pan; he noticed that when he let the water run away from the 'colors' of gold and then let it come back slowly, the colors floated and came running toward each other. He imputed it to some sort of magnetism. A vigorous shake of the pan sent the gold to the bottom. This is explainable on the theory of capillarity, the weight of the flat particles of gold being insufficient to overcome the surface tension of the water until the air cushion was broken by shaking the pan.

In regard to this phenomenon—that is, something we cannot quite explain—it has been shown, by the experiments referred to, that most substances condense air on their surface, which acts as an air-bell to buoy them up. When a solution in which a gas is generated by some dilute acid, such as sulphuric, is employed, there is a condensation of gas on the surface of minerals and the formation of a film that is persistent to a varying degree.

Even perfectly dry sand, especially if it be in perfectly angular particles, will float on water. Iron pyrite is easy to wet and therefore difficult to float,

whereas the contrary is true of stibnite. Experiments made with the last-mentioned sulphide and with molybdenite show that in hot water the particles of mineral will float, by reason of the bell of air and steam formed on their surface. It amounts to this, that all solids have on their surface when dry a film of gas, usually air; those that yield up this film in water become wet and sink; while others, especially certain sulphides, possessing 'greasiness,' do not part readily with this film, are not wetted and will float. The air-film can be increased by the slow generation of some other gas, such as the carbon dioxide derived from the carbonates in the ore, through the action of a dilute acid, particularly when a sulphide, slightly oxidized, is coated with its equivalent carbonate. It is on this fact that the new processes depend; they represent one of the most interesting departures in metallurgy and they promise to be of exceeding importance because of their application to a class of ore beyond the reach of ordinary methods.

Air Blasts in Mines.

Recent press despatches from Houghton, Michigan, have stated that many miners in the Lake Superior copper region have left work because earthquakes or air-blasts have been so frequent and so severe as to endanger their lives. In several mines there have been a series of shocks of more than ordinary intensity, and even at surface houses have been shaken and disorder created in the china pantry. As a rule, these disturbances are sensitive to atmospheric conditions; it has been noticed that they begin shortly after midnight, to continue to a less degree during the following daytime.

This is an interesting subject, the more so because it is not well understood. Similar occurrences underground have been recorded in the Hillgrove district, New South Wales, and in the Mysore mines, India. Miners usually impute these rock 'explosions' to earthquakes, to gases and to the 'little men,' the gnomes who, according to folk-lore, are supposed to delve underground when the workmen leave the mine. These 'air-blasts' are not really explosions, but they are due to the bursting of rock under great pressure and the disturbance to the air of the mine produced by the shock of disruption. They characterize mines where the rock is under particular strain by reason of big cavities created by stoping, causing large masses of rock to exist under unbalanced stress. It is the custom to support the hanging wall by means of portions of lode which are left standing, to do duty as pillars; these pillars hold the ground until the pressure from above becomes too much for them. Then they do not yield gently, but, like a cubical block under a testing machine, they break suddenly with explosive violence. The bursting force is due to external and not to internal conditions, as has been pointed out by Mr. F. W. Sperr, professor of mining in the Michigan College of Mines. When the pressure has become more than the pillar of rock can bear and the moment of rupture has arrived, even the scratch of a pick will precipitate a crash. When this happens, the walls of the stope will vibrate and an earth-tremor is transmitted to surface. Where the rock will not stand and the walls yield slowly, so as to close the excavations made by mining, there are no air-blasts or similar disturbances. Where large areas of roof are left unsupported in flat veins, it sometimes happens that the hanging finally falls suddenly, and then, acting like a piston, it forces the air out of the old stopes with all the violence of a gas explosion. But it is the former and not the latter case that obtains near Houghton. In such mines as the Quincy, where the copper lode dips at 37° and an area several thousand feet in both directions has been excavated for a width of 8 to 20 feet, there is a big 'overhang' and an excessive pressure, which is suddenly released when one of the pillars in the old stopes gives way. It is a question whether it would not be better to 'rob' the pillars and permit the hanging to come down and 'key' itself. In New South Wales, in mines similarly affected, the rock is a silicious slate, which, after exposure to the air, splits and 'kicks' with violence, although the more serious 'explosions' occur when a 'bridge' is being removed below a level. Men's faces have been badly cut by flying splinters of rock. It is held by Mr. J. B. Jaquet, the Chief Inspector of Mines in New South Wales, that the 'kicking' is due to the fact that the slate is so brittle that it breaks rather than bends; it resists pressure as long as possible and then bursts, this being hastened by the shock of blasting or hammer-work. The large explosions are due to the same general cause, namely, a general condition of strain due to the removal of rock by mining. It is noticed that the disturbances at Hillgrove have gained in severity as the mine has deepened; in the neighboring Sunlight mine these troubles are unknown, because the workings are in a slate of a more yielding character. It has been recommended that in 'kicking' ground the pressure be taken up gradually by the use of soft head-boards in conjunction with stulls and the filling of stopes when they approach the level above. In the case of wide lodes, such as the amygdaloid copper veins of Lake Superior, where timbers are used sparingly, if at all, and pillars are left to support old workings, there is nothing to prevent such troublesome consequences as 'air-blasts,' and the annoyance, with possible danger, due to them is sure to increase as the strains in the rock become greater in the course of deeper and more extended workings.

Harnessing the Zambesi.

When one remembers that Livingstone was rescued by Stanley only twenty-five years ago and that Stanley himself emerged from his last great exploration of the Dark Continent only sixteen years ago, these events marking the breaking of light into the slave-trodden gloom of central Africa, we are likely to appraise at its proper value the building of a cantilever steel bridge over the Zambesi, the construction of a railway to Lake Tanganyika and the meeting of the British Association for the Advancement of Science, with the son of Charles Dawson as its presiding officer, at the Victoria Falls, where the great river hurls itself into a deep cleft cut in the level plains of central Africa. While civilization has been advancing into the hinterland of the once dark continent, the conquest of industrial art has been emphasized at Johannesburg, where gold to the value of a hundred million dollars per annum is being steadily produced. And now, in the fulness of time, there comes the proposal to harness the untamed energy of the Zambesi for the service of man; the project is being discussed of transmitting electricity from the Victoria Falls to the mines of the Rand. The distance is 556 miles in a direct line, or 745 miles indirectly along the new railroad. It is agreed that the horsepower available varies between 300,000 and 500,000 by the direct drop of the water at the falls. Electric transmission of this power by the Thury constant direct-current system is considered perfectly feasible, but it is seriously questioned, by such an authority as Professor W. E. Ayrton, whether the scheme would prove profitable, because there is not likely to be sufficient demand for power along the route to justify the transmission the whole distance involved in a line to Johannesburg. It is estimated that about 150,000 horsepower is needed by the Rand mines and their associated industries. Another disturbing factor is presented by the existence, in the Transvaal and in Rhodesia, of coalfields, the product of which might be burnt as a source of energy to compete with the great electrical enterprise. Ayrton holds that at a price of $2.50 to $3 per ton, excellent coal can be delivered on the Rand, and that this fact kills the commercial possibilities of the long-distance transmission of power. At the present time it costs about $100 per horsepower per year on the Rand and $15,000,000 is thus spent annually. Niagara transmits 24,000 horsepower to Buffalo, 30 miles distant, for 14 cents per horsepower-hour, equivalent, on an 8-hour basis, to $124 per horsepower year, or more than the present cost of power at Johannesburg. In other words, the projectors of the Zambesi scheme expect to transmit power 745 miles at a cheaper rate than it is delivered at a distance of 30 miles from Niagara. We may add that the voltage to be used, under the Thury system of high-tension direct current transmission, is 140,000; a number of generators will be used in series and the center point of the generating system is earthed so that the pressure of each conductor above earth is 70,000 volts. The line will be built of aluminum cables—not copper—supported on steel towers. The project continues to be the subject of vigorous discussion in electrical journals.

By the Way.

In a recent address before the American Association for the Advancement of Science, in discussing the effects of transportation on combination, Mr. Martin A. Knapp said:

When movement was measured by the strength and endurance of animals, only a limited area could be reached from a common center. Its slowness and expense confined all inland distribution within narrow bounds. Only 80 years ago it took a week to send a letter, and cost $125 to move a ton of freight from Philadelphia to Pittsburg; and the average price for carrying the necessaries of life was not less than 20c. a ton for each mile of distance. On such a basis most commodities were shut off from distant markets, and farm products, for example, would seldom permit of conveyance more than 100 or at most 150 miles. Only such articles as were of small bulk and weight compared with their value were moved to any considerable distance from the place of production. For this reason the requirements of an ordinary family were almost wholly supplied from near-by sources. And this means — without amplifying the statement — that productive energy, for the most part, was restricted by the consuming capacity of the surrounding neighborhood. The forces outside each little circle were but feebly felt and had slight influence upon its separate affairs. Broadly speaking, the business of each locality was adjusted to its own conditions and was practically undisturbed by like operations in other places. What we call competition was held in check by slow and costly means of conveyance; its effects were moderate and limited, its friction seldom severe.

But the use of steam for motive power and electricity for sending news increased enormously the range of accessible markets, and at once intensified competition by the celerity and cheapness of distribution. Industrial strife has already become world-wide in extent, and distance an ineffectual barrier against its destructive assaults. For distance as a commercial factor is not at all a matter of miles, it is merely a question of time and money. So the effect of cheap conveyance and quick communication is to bring remote places closer together. For all the practical needs or enjoyments of life, Manila is nearer New York now than Montreal was a century ago; and the whole world could be easier governed from Washington today than could the United States when the capital was located on the Potomac.

Our grandparents got their supplies mainly in the neighborhood where they resided, and only a few persons were concerned in their production. Today it may safely be said that five millions of people and five hundred millions of capital are directly or indirectly employed in furnishing a family dinner. When merchandise of every description is moved by the ton at great speed from one end of the land to the other, and at an average cost of less than three-quarters of a cent per mile, as is now the case, the expense of transport is but a trifling impediment to the widest distribution.

Nor should we forget that it was the opening up of new and ever enlarging markets, by the cheapness of steam transportation, which gave the first opportunity for the extensive use of machinery; and this in turn quadrupled the capacity of labor and greatly reduced the cost of large-scale production. By this revolution in the methods of manufacture—caused by the railroad and steamship—the mechanic was supplanted by the operative, and the skilled and independent craftsman of former days found his occupation gone. For what chance now have handmade articles when the factory-made product is carried across the continent at nominal cost? But the factory without the railroad would be only a toy-shop. If its wares had to be hauled over country roads by mules and horses, the points they could reach would be few and near by, and thus contracted sales would limit the size of the plant and the volume of its business. It is simply because transportation is now so speedy, so cheap and so abundant that great establishments have become profitable and driven their smaller rivals from the field.

These facts bear directly, and with a force not fully perceived, upon the whole problem of industrial competition. The argument runs this way: As the means by which industrial products are distributed become more convenient, quicker in action and less expensive, the area of distribution rapidly enlarges, and as the area of distribution enlarges the competition of industrial forces increases in something like geometrical ratio. The movement of property by rail in the United States alone already exceeds four millions of tons every 24 hours. Think of the rivalry of products, the strife of labor, the strain and struggle of trade, which such a movement implies. With the constant acceleration of that movement, which is certain to happen, how long can the friction be endured? How soon will it become unbearable?

The truth is that new conditions have arisen and new methods must be adopted. All the pressure of modern life impels to the co-ordination of effort. We see that discord and antagonism, to say nothing of their moral bearing, have far less efficiency than harmony and co-operation. The world is searching for economies. It is intolerant of needless expense.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

AS MANY giants may be operated on a gravel bank as can be supplied with the water available.

BENDS may be made in pipe-lines fitted with flange unions by using unions provided with angles of suitable degree.

COMPANIES organized under the laws of other States and operating in California are subject to the laws of California.

THE chief ingredients of the phonolite of the Black Hills, South Dakota, are sanidine, nephelite, ægirine, noselite and sodalite.

THE averaging of mine assays without reference to the amount of ore which each assay represents is entirely useless—it means nothing.

OWING to the curvature of the earth, a mountain 5,717 ft. in height would be invisible at the distance of 100 miles, viewed from the seashore.

CLOTH dipped into a 30% solution of ammonium phosphate, and dried, becomes uninflammable. It will char but not blaze, and the fire does not spread.

IN many stamp-mills the capacity per stamp exceeds five tons daily, but large capacity is not always synonymous with the best obtainable economic results.

THE addition of manganese to steel is said to increase its tensile strength and reduce its malleability. Both manganese and chrome steel are extremely hard.

A POCKET mine is a peculiar piece of mining property. When in bonanza, the owner will only sell at an exorbitant price, and when no gold is in sight no one cares to buy.

WHERE black sand, upon assay, shows high values in gold, but none of which can be obtained by amalgamation, the sand should be shipped to a smelter for treatment.

SOME of the tallest chimneys in the world have been built of concrete. More recently it has become the common practice to re-inforce concrete with upright steel bars.

GASOLINE ENGINES, or similar devices of any kind, cannot safely be employed underground in mines, unless the exhaust gases can be conducted by pipes out of the mine.

IT was until comparatively recently supposed that the centrifugal type of pump was only adapted to low heads, but it is now known to operate with equal success under high heads.

THE semi-cemented gravel and sand found in desert countries is known throughout the Southwest and Mexico as caliche. It is often gold-bearing, and in some localities rich in gold.

SHEET LEAD may be joined for the purpose of lining tanks or barrels to contain acids. About acid works men are employed to do this class of skilled labor, who are known as 'lead burners.'

CHLORIDE AND HORNSILVER are different names for the same ore. The technical term for silver chloride is cerargyrite. It occurs in finely disseminated grains, in flat flakes and both in masses or veinlets.

IN the Western mining States there is always a discount on the price of copper, from two to three cents per pound, below New York prices, on account of transportation, refining charges, commissions, etc.

COATING copper plates with silver, in order to catch gold by amalgamation, originated in California. The use of copper plates, with an amalgamated surface, was first adopted in placer mining, also in California.

IN many mills where the tailings contain from 50c. to several dollars per ton, better results could be obtained if more attention were given to closer saving and less to capacity. However, the economic conditions must determine.

PLANED four-inch boards make a good floor for a canvas slime-plant. The lumber should be well seasoned, and the boards, when nailed down, should have about half an inch space between them to prevent buckling when wet.

THERE is a law on the statute books of Utah which makes it unlawful for two corporations to exist in that State having the same name. This sort of legislation might be extended to include the duplication of the names of mines, a practice all too common.

THE square-set method of mine timbering was first introduced into the Ophir mine on the Comstock Lode, Nevada, in 1860 by P. Deidesheimer. It has since been employed in every part of the world, though there are many modifications of the original method now in use.

ALTITUDE is not a factor in the operation of a gas or gasoline engine. It works equally well at high or low altitude. The engine depends upon the expansive force of the gas created by the ignition of the gas or vapor, which is entirely independent of the pressure of the atmosphere.

IN sharpening drill steel, the blacksmith must carefully avoid overheating it, as this destroys the carbon in the steel, which renders it useless. When this occurs the burned portion had better be cut off, as only an expert can treat the metal so as to render it reasonably serviceable again.

ADJOINING claim-owners may by agreement sink a joint shaft on the property line, either on the vein or any other place, for development. In such case $200 worth of work must be done in the shaft annually if it is intended to make this work represent the annual assessment on two unpatented claims.

THE California State Mining Bureau has issued fairly good maps of the desert region of southern California, and Bulletin No. 208 of the United States Geological Survey contains a good map of southern Nevada and a part of California. These maps show many of the roads and springs, and are of great value to prospectors.

MINERS sell promising mining claims to secure capital to prosecute their calling—the discovery and development of new mines—to better advantage. The fact that the prospector wishes to sell out is not an indication that his mine is worthless, any more than that a stock of goods is without value because the merchant desires to sell.

IT is unwise to carry the stopes in a mine too close to the shaft when the latter is sunk in ore, or where it passes through an orebody. A large-sized pillar should be left about the shaft, which may be removed when abandoning the mine. Failure to leave a pillar, as suggested, may result in the necessity of sinking a new shaft.

AN alternating current in electricity means a current which changes its direction with great rapidity. The number of alternations per minute is determined by the number of revolutions of the armature. If the armature of a bi-polar dynamo makes 3,000 revolutions per minute, then there are 6,000 alternations of the current during this period.

IN many of the large pits created by early hydraulic mining operations in California there has appeared a growth of pines and other trees, almost equaling the neighboring forest which remained untouched by miner or woodman. Some of these pits cover many acres, and near Gold Run and Dutch Flat the denuded area spreads over several square miles.

STEEL RAILS weighing 35 lb. to the yard are heavy enough for use in inclined shafts sunk at any angle. Such rails will carry fairly heavy traffic without bending under ordinary conditions on light railroads. Skips in mines rarely weigh, with full load, over seven tons, and usually not more than four tons; consequently, 35-lb. rail is heavy enough for any mine-shaft traffic.

THE assay ton contains 29.166 gm., and the ratio of the assay ton to the milligram is the same as that of a ton of 2,000 lb. avoirdupois to the troy ounce (1 in 29.166), therefore, if an assay ton be taken for test, the number of milligrams of gold contained in the assay ton indicates the number of troy ounces of gold in a ton of the ore of which the portion assayed is a sample.

THE cost of producing a pound of copper cannot be arbitrarily stated, as it varies greatly at different mines, and also at the same mine with variable grades of ore. It is manifestly cheaper to smelt copper from high-grade than from low-grade ore, but the mining costs may vary so greatly that the metal may cost less per pound from a large low-grade deposit than from a small high-grade vein.

AN OPEN *arrastre* is made and operated in the same manner as any other, except that the screens are dispensed with, and the drags are run more rapidly than is usual. For the best success mechanical power of some kind should be employed — water, steam, gasoline or something else. The open arrastra is generally used to disintegrate gravel that is partly cemented and really does not require stamping.

THE highest altitude at which gold dredging is successfully practiced, known to 'Concentrates,' is that near Breckenridge, Colorado, which is about 9,000 ft. above sea level. Most of the dredging being done in California is only a little above tide-water. Several years ago a steam-shovel was employed for a time on dry gravel in Holcomb valley, San Bernardino county, Cal., at an altitude of 7,000 feet.

WHEN a crack has developed in a sheet of metal, its further progress may be stopped by drilling a hole where the crack ends, which is not always easy of determination unless care be taken to find it. This may be done by moistening the surface of the metal with petroleum. Rub clean and dry and then apply chalk. The petroleum, which has penetrated the finest crack, oozes out and makes itself visible on the chalked surface.

ONE of the largest water installations for mining purposes in California in early days was that of the Park Canal & Water Co., taking water from the Cosumnes river. It had 290 miles of ditch, eight miles of flume and one mile of pipe-line. This system cost $2,000,000. The Mokelumne Hill system cost $500,000 and that of La Grange Company $450,000. There was invested in hydraulic mining business at the time of its inhibition about $100,000,000.

TOPOGRAPHICAL SITUATION has much to do sometimes with the cost of equipping a mine. 'Concentrates' has knowledge of a number of mines where the machinery was delivered at the top of a hill or ridge back of the mine, and 'skidded' down the steep slope by means of ropes snubbed around trees, or by block and tackle. It is seldom that machinery placed under such difficulties is ever removed elsewhere, whether the original venture is profitable or not.

WHERE the land about a proposed shaft is flat and no dump is available, a substructure of heavy timbers may be built up about the site of the shaft and extending upward 8 or 10 ft. or more. The rock hoisted from the shaft may be dumped around it, filling in the timber frame and rendering it rigid. In time a gallows-frame may be set upon, this substructure, and mining proceed as in other places where the shaft is located on a hillside.

THE Colorado Supreme Court recently decided in a tunnel case that the proprietor of a claim may drive a level through an adjoining claim owned by another to reach his vein lying beyond. This was on the grounds of 'eminent domain.' The courts have not heretofore recognized mining as a public utility, and the right of eminent domain did not obtain. Before this decision can be recognized as final it must be passed upon by the Supreme Court of the United States.

A DUST ARRESTER which proved successful was installed at the copper smelter of the United Globe mines, near Globe, Ariz., some years ago. It consisted of a cylinder 8 ft. in diameter and 72 ft. long. It was placed horizontally on the roof of the building, just back of the blast furnace stacks, and was connected with them by pipes 36 in. in diameter. The smoke and dust were drawn into the large cylinder and carried toward one end, where the dust accumulated, and thence conveyed to a briquetting press situated below.

EXPERIENCED hydraulic miners always avoid breaking down the gravel bank in the form of a horseshoe. If this is done, in a short time the miners find themselves surrounded on three sides by the banks, and unless the workings are very large they can no longer work to advantage. There is also an element of great danger introduced when the face is not kept in a nearly straight line. This involves the necessity of more than one giant, or the frequent re-setting of the one, if only a single giant is in use, but it pays in the end to keep the bank straight.

AS BETWEEN the various types of crushing mills now on the market, the would-be purchaser must take into consideration the character of the ore to be crushed; whether sliming will be disadvantageous or not; the adaptability of the several mills as amalgamating devices (should amalgamation be contemplated); the amount of power required to operate the mill relative to its capacity; the wear and tear and liability to breakage and accessibility of foundry or machine shop, where necessary repairs may be made. All of these things, as well as original cost and expense of transportation, setting up, etc., should be considered.

WHERE two claims overlap and the prior location has expired by reason of non-compliance with the law, the newer claim may take the ground wholly, or in part, covered by the former location. It may be the better way to re-locate the abandoned claim, to prevent others from taking the otherwise unoccupied portion of the first location, for, unless claimed by another, the prior locator's title is still good until the ground is claimed by a new comer, when he no longer has a color of title to the land. Of course the laying out of two locations will necessitate the performance of work on two claims, or of $200 on one of them for the benefit of both.

ALTHOUGH there would seem to be no good reason why the chlorination of ores by means of chlorine generated by electrolysis should not be commercially successful, we do not know of any place where it has been a commercial success. The method has been tried repeatedly during the last 50 years, both in the wet and the dry way, and often succeeds very well in small-scale tests. The only large-scale experiments in 'chlorine smelting' are in connection with the treatment of certain zinc-lead-silver ores by electrolysis with fused zinc chloride. One difficulty is the disposal of the by-products, for mines are rarely at industrial centers. A number of results have been published in the journals on this subject, but we do not know of any place where these methods are in successful commercial use.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir — An interesting discussion has arisen here in regard to the proper shape and dimensions for a deep shaft, involving the questions of speedy sinking and the adaptability of the shaft afterward to the economical handling of dirt and water.

The shaft contemplated was proposed to be sunk to a depth of 2,300 ft. The character of the vein in the upper levels warranted expectations of a large tonnage of ore, while experience in other properties in the neighborhood pointed to the probability of enough water to justify preparations for pumping. Consequently it was deemed advisable to provide for a possible hoisting capacity of 1,000 tons of rock per day, together with a sufficient compartment for pump and ladder-way.

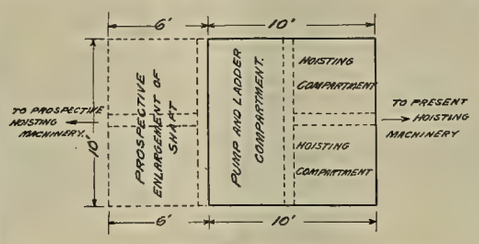
The manager made the general proposition that for the required capacity, a three-compartment shaft 5 by 16 ft. would be of sufficient size, admitting of two hoisting compartments each 4 by 5 ft., and a pump and ladder-way 5 by 5 ft., exclusive of the timber. The firmness of the walls of the shaft would permit the elimination of wall-plates, thus economizing a considerable amount of timber, as well as two feet of excavation in the side of the shaft to make room for the wall-plates, the item of timber especially running into a good deal of money in this part of Mexico.

At the most convenient site for the projected shaft, an old Mexican shaft, 10 ft. square and 320 ft. deep, already existed. The old shaft was in perfect condition as far as the firmness of the walls was concerned, and it was proposed by the company to utilize this old shaft, starting to sink in the bottom of it. In attempting to adapt the old square shaft to the requirements of a three-compartment shaft, complications were introduced. It was proposed to make use of the old shaft, the width of which would easily permit of two hoisting compartments side by side, allowing a space 6 by 10 ft. for these two compartments, a space 4 by 10 ft. would then be left for pump columns and ladder-way. In starting the new part of the shaft, however, it was proposed to change the dimensions, increasing the length to 16 ft., while, at the same time, reducing the width to 5 ft., making the new part of the shaft 5 by 16 ft. This would make a jog at the point where the sinking would be resumed. The hoisting compartments would be carried down into the new portion with the same dimensions as that allowed in the new shaft, and the pump columns would be brought into the end compartment, constituting the jog between the old and new shaft, by a gradual curve, care being taken to avoid anything approaching an elbow. The subjoined sketch will serve to further explain the change proposed.

All of this, when submitted to the directors, was very vigorously opposed, they claiming that the best plan to pursue would be to carry down the shaft with the same dimensions as started by the Mexicans, namely, 10 by 10 ft., or to make it 10 by 11 ft., and to make such dispositions as would permit of the shaft being lengthened, making it finally 11 by 16 ft. These last dimensions were supposed to be necessary to maintain the production spoken of above, but it was not proposed to make the shaft the full size until the lode had been proved up and the showing found to warrant the expectation of 1,000 tons per day.

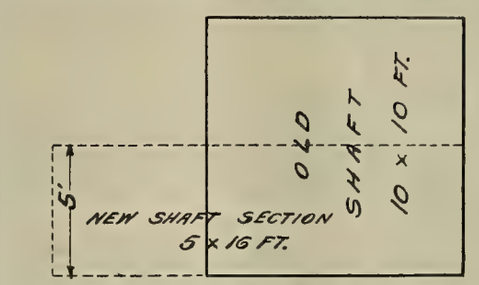
The directors further claimed that: (1) It would cost very little, if any, more to sink a shaft 10 by 10 than one 5 by 16 ft. (2) A deeper cut might be made in a 10 by 10 shaft than in a 5 by 16 shaft. (3) The shattering of the sides of the shaft would be much greater, or the number of short holes needed to square out the shaft would be more in a shaft 5 by 16 than in a shaft 10 by 10. (4) A shaft 10 by 10 would give the same number of hoisting compartments and a larger compartment for pumping, ladder-way, and general pipe and electric wire purposes. (5) In view of the possibility and probability of a later necessity for a large hoisting capacity — larger than possible or advisable for two hoisting compartments — the enlargement of the 10 by 10 shaft to a 10 by 16 shaft, which, as shown in annexed sketch, would give four hoisting compartments and one pump compartment in the center of the shaft, and could be done much more cheaply and quickly than sinking another hoisting shaft. This is an eventuality which we have to take into serious consideration. Objection was also made to the jog at the bottom of the old shaft, principally on account of the possibility of not being able to hoist or lower pump columns, or anything else that might be needed in that compartment.

Those who favored the narrow shaft, brought forth various objections to the 10 by 10 shaft, among which was mentioned the inconvenience of timbering a shaft 10 ft. wide, to say nothing of the increased size of the timbers necessary for these dimensions, in this way adding materially to the expense. It was admitted that the jog was an undesirable feature, as it detracted from the symmetry of the shaft. It was not admitted, however, that the reason for hoisting through the pump-way constituted a valid objection. Even though the pump compartment might be straight enough to hoist through, it was held that generally it would be easier and simpler to use the hoisting compartment for handling the pump sections, unless it were a question of water columns for a Cornish pump, the use of which was held to be extremely unlikely. In the event of repairs to pump columns, the joints are generally removed singly, and it is certainly easy enough to swing a joint of ordinary pipe from the hoisting compartment into the pump-way through the timbers. Those on the ground in Mexico also claimed that the speed of shaft sinking depended rather more on the amount of dirt to be taken out than on the depth of hole drilled, that is,

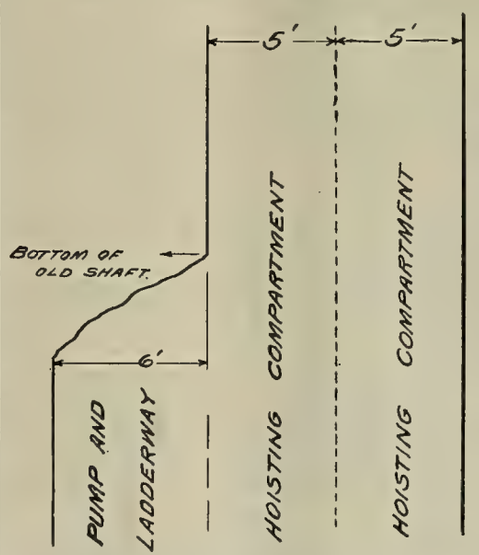


Manager's Proposal.

within the limit of a reasonable depth; the mucking being the principal item in the consumption of time, generally requiring more time than the drilling. The speed of sinking, therefore, depends in a large degree on the shaft section, and with a given hoisting capacity it is almost proportionate to the size of the section. In the actual drilling, the size of the shaft does not make so much difference, because the larger the section, the larger the gang of drillmen that can



PLAN OF SHAFT SECTIONS.



VERTICAL PROJECTION OF THE ABOVE PLAN.

Directors' Proposal.

be accommodated. There is no way, however, to take advantage of the mucking in a shaft of larger section, because the buckets can only be hoisted as fast as the machinery will run, and it will be found generally that the buckets will be filled and waiting, especially after the depth of 300 ft. is passed. It was also felt, that if such dimensions as the directors proposed were advisable, they would have been adopted long ago in South Africa, California, and other mining regions where the subject of deep shafts has been under consideration for many years by some of the most experienced mining engineers of the age.

This, Mr. Editor, is submitted with the hope that it will provoke some remarks from those of the mining fraternity, whose experience has led them to study the subject of shaft sinking.

R. H. BURROWS.

Guanajuato, February 5, 1906.

ELECTRICITY VS. COMPRESSED AIR FOR MINE OPERATIONS.

The Editor:

Sir—The discussion between Mr. E. A. Rix and Mr. W. R. Hulbert upon this subject is interesting to us, who are actively concerned in the practical operation of the two forms of power, and I believe much good can be gained from their articles. My experience with compressed-air and electricity in mining operations leads me strongly to favor Mr. Rix's side of the argument; I shall confine my reasons for siding with him by stating a few points which he has not taken up as thoroughly as I believe is necessary.

We, who have mined, know the air-drill, know what it will do under the most adverse conditions, and have learned to place our confidence in it; the electric-drill, today, is by no means such that it has our confidence; I have seen tabulated results of competitive tests between air and electric-drills. On paper it looked very favorable for the latter, but we who have used both underground from week's end to week's end, have reason to doubt these figures.

The electric-drill, to operate successfully, depends upon certain conditions; among these conditions are: 1st. It needs a runner who thoroughly understands the drill and its mechanism, and who has a good stock of patience. 2nd. The drill must be handled with care; it has many frail parts, such as springs, gearings and flexible shafting, etc., which will not stand rough usage.

To explain my point, I will describe the conditions existing in the mining camps of the West. I want a machine-man, or I may want 10 or 15 of them. I cannot ask such a man for his credentials as a mechanic or electrician, but I am forced to take whomever I can get; he may be a good machine-man and he may not; if he is put on an air-drill he may knock it around and abuse it, but he does little damage to it; if he is put on an electric-drill, he must know something about it, mechanically, and must not hit it with a single or double 'jack' when the hole is 'fitcured.' It is the custom, when the drill sticks in the hole, to jar it loose with a hammer; I have seen a drill-runner hit the 'chuck' with a 'double-jack' so hard that it would have wrecked an electric-drill. You may say that such a man should be discharged; well, he should, but you cannot watch every man in a mine for eight hours; and should you discharge him, his successor will probably do likewise; and in the meantime your electric-drills are going to the repair shops and the scrap heap.

It is all very well to say an electric-machine will drill as much ground as an air-machine; it will do so in a uniform block of granite, but get it underground in the wet and dust and dirt, start in on a stratum of rock having 'slips' and 'vug-holes' occurring at any and all points, and I believe you will find the air-drill will walk away from the other.

The factor of air-compression, at high altitudes, is the strongest point in favor of electricity. I believe Mr. Rix treats it too lightly in his article of January 8. At an elevation of 10,000 ft. a compressor loses 50% of its efficiency, and it takes about 130 cu. ft. free air to run a 3½-in. drill; this, of course, makes the operation of drills expensive. It is in high altitudes that the electric drill is making its strongest bid for favor, and in consequence mining men in the San Juan district, Colorado, have been led to experiment with it carefully. I can specify several large companies that have done so only finally to discard them; among others may be mentioned the Silver Lake, Sunnyside, Liberty Bell and the Frisco mining companies; there are several smaller companies also that have experimented. The general cry against the drill is invariably the same from all, namely, too frail to stand the hard usage underground, high repair expense, and inability to compete with the air-drill in various kinds of ground.

The air exhausted from the drill is an important factor underground, be it in a shaft, raise, drift or stope; I have seen many cases where the machine exhaust was almost the sole source of air-supply for the miners; when the machine was shut down the air would become very poor, and as soon as the air was turned on one could breathe with comfort. This method of ventilation is not expensive for, as Mr. Rix states, the air used is a by-product. As there are always other provisions made for ventilating the main workings of a mine, compressed air is very seldom used, on a large scale, for this purpose; there are too many other methods that are cheaper.

In the San Juan region (the triangle included between Ouray, Silverton and Telluride) compressed air is used almost exclusively; in most cases the compressors are belt-driven, with electricity as the motive power. This electricity is furnished either by a custom plant or is generated by the mining company itself. Some of the mines in this region are controlled by large companies that employ as managers or consulting engineers the best men procurable in the profession; these men are active and wide-awake

to gain the best results possible for their respective companies, they are familiar with all the latest mining machinery and are constantly on the lookout for some contrivance that will cut down operating expenses, they all, or nearly all, have tried the electric drill—with what result? You go to the machine shops and in the corner, where the scrap heap is, you find electric drills of every make and kind. These representative men of the mining profession have discarded the electric-drill. Could the air-drill ask more as a recommendation?

I do not want the electric-drill people to think that I am a knocker at heart, for I am not; I believe that some day the electric-drill will be made a practical machine for underground work, and when that time comes, I shall be one of the first to acknowledge it. We all admit the saving of power of the electric-drill over the air-drill—we cannot get around that fact—and we all want to operate as cheaply as possible, but in the air-drill we have a machine we can depend upon to do our work under any and all conditions and still put up with much abuse from the miner; the electric drill will not do that.

A word about these competitive tests. They are in most cases positively worthless; they are made for a shift or two in a rock that is advantageous to one drill or the other (intentionally or otherwise) and the drill which has shown its supposed superiority advertises a great victory. There is but one way to conduct such a test: take the two machines in question and put them together or in opposite shifts in a drift (shaft, raise or stope) for a week or two, then change them to another part of the mine in different rock or ore. During these periods keep careful account of all repairs, break-downs, amount drilled and all interesting data, sum it all up at the end of the test and decide which you want to buy. The drill that does the best work in one mine or district will fall below the standard in another mine or district.

I have confined myself to drills in this letter, for the reason that Mr. Rix has dealt with compressed-air machinery in general; I believe that this subject of drills is one of great importance, as there is so much money being expended by mine operators in experimenting in this direction. I hope both Mr. Hulbert and Mr. Rix will deal with the subject again, giving figures and data for us to think over and compare with our own figures. As you, Mr. Editor, state in your note at the end of Mr. Hulbert's article of Jan. 27, unless figures are accompanied by all the conditions under which the tests are made, they do not mean anything.

H. R. Plate.

Denver, February 15, 1906.

Manufacture of Plaster of Paris.

The gypsum rock is reduced by a jaw crusher (cost, $1,000) to about one-inch cube. As this material is mined in large cakes, the opening must not be less than 20 by 12 inches. When crushed, the rock is dried in a rotary direct-heat dryer (cost, about $2,500). The products of combustion used in drying this material should not pass through the material on account of the danger of coloring it, that is, the drying must be done on the outside of the dryer, only. The size of the dryer will depend upon the capacity required; it should connect with a chamber to settle the dust, which is valuable. After the gypsum is thoroughly dried, it is again thoroughly crushed on an ordinary pot or bowl-crusher (cost, $300). It should then be ground to about 80-mesh. French buhr-stones are generally used (four of these, at $300 each). The ground gypsum is then passed into a calcining kettle (cost, $1,200 each), usually 8 ft. diam. and 8 ft. high, with gears, flues, fire-front, grates and doors, also with upright shaft and stirrers near the bottom, driven with heavy gears above. The ground material is slowly passed into the calcining kettle, which soon begins to boil. More material is gradually added, until the kettle is full. From the gypsum rock that has been crushed and dried thoroughly, a portion can be calcined within about one and one-half hours, the time depending upon the dryness of the gypsum and the quality of the finished product. The material contains enough moisture to boil it thoroughly for a short time, after it comes to a dead state; then it will boil a second time, and in many cases even a third time; the more it boils the quicker it will set. For ordinary plaster work only one boiling is required, but for fine work or plaster of paris two boilings are necessary. This calcining kettle is where the mechanical change takes place. After it is sufficiently calcined or boiled, as it were, it should be immediately emptied and placed in hoppers or bins made of iron or brick, after which it is ready to be conveyed and elevated to storage bins, from which it is packed into sacks or barrels ready for the market. As soon as the kettle is emptied, another charge should be immediately put in.

To manufacture, say, 100 tons of plaster per day, it will require the machinery mentioned above, with the addition of the necessary hoppers, bins, conveyors, elevators and the power. If it be desired to make this material into wall plaster, it will be necessary to add further one sand dryer and a hair picker; also the necessary apparatus for mixing the different materials.

The Price of Copper.

During the past few months the high level of prices for copper was not reached without some manipulation; but it must be admitted that the condition of the market—especially the statistical situation—fully justified an extremely high level of prices. The fact was that, according to the best information obtainable in the trade, surplus copper supplies in this country were actually wiped out, and the urgent demand on the part of home consumers forced the sellers to put up their prices for their home production. Of course, the wild stories which were circulated, as to the possibility of a 21 or 22-cent price, had the effect of inducing some consumers to 'overbuy' for forward delivery; but this did not occur until very late in the period of advances, and was probably mostly done by such consumers who had hesitated to buy at much lower prices. A glance at the statistical situation will show the justification for the high price of copper up to the end of 1905:

	Pounds.
The exports of copper during the first six months of last year amounted, in round figures, to	280,000,000
The total available supplies from production and imports for the whole year are estimated at	1,100,000,000
Or for the first six months, assuming the same ratio	555,000,000
Deducting exports	280,000,000
There remains available for home consumption	275,000,000

According to conservative estimates, consumption in this country probably absorbed 50,000,000 lb. per month, and it is evident that, if consumption during the first six months of 1905 absorbed such an amount of copper, the available supplies had to be drawn upon. Consequently, when the home demand—with a general revival of business in the steel and iron trade about the middle of last year—commenced to improve, and purchases were made for forward delivery, the market was found to be bare of stocks and easily advanced to 19 cents or thereabout.

Production is increasing, and a conservative estimate will put the figures for 1905, including the increased imports from Mexico and Canada, at 1,250,000,000 to 1,300,000,000 lb.—say at the rate of about 105,000,000 lb. per month. Exports have fallen off. China, which took during the last year 80,000,000 lb. of our export copper, is re-shipping part of the copper which the Chinese speculators had bought for the different mints to Europe. The total exports of copper for the past year, according to the official statistics, amount to 534,907,619 lb., of which about 80,000,000 went to China, leaving for Europe about 455,000,000 lb., as against European takings in 1904 of 555,000,000.

The effect of the high prices on European purchases was immediately apparent during the year 1905. Exports to Europe continued large during the first part of 1905—that is, as long as European purchasers were receiving copper which they had purchased at low prices during the latter part of 1904; but exports fell off during the latter part of the year and are now at rather a low ebb. They were about 15,000 tons, or 33,000,000 lb., during January, and are not likely to be very large during February and March. With the increased production, this will leave available for home consumption from 65,000,000 to 70,000,000 lb. of copper. It seems quite reasonable to suppose that, as long as the iron business continues as good as it has been, domestic consumers will absorb most, if not all, of the surplus left over after exports have been deducted from the production, although, as stated at the beginning of this letter, some consumers may have bought a little bit more copper than they actually need at present and may be willing to carry it over until later months.

At the present time there is a good deal of controversy and question as to the correct price of copper. The big producers in this country, probably controlling 75 per cent of the total production, have not changed their prices from the top level reached—that is, 18¼ to 18¾ cents for Lake and 18⅝ to 18¾ for electrolytic. But copper re-shipped from China has been pressed on the European market, and has been sold far below these prices. This has, naturally, tended to demoralize the domestic market, because the European consumers who are expected to supply themselves for the bulk of their copper in America have been able to cover their wants to better advantage by purchases of American copper re-shipped from China.

As with any staple article, so with copper, a small surplus creates the price for the bulk, and, therefore, at present the price is being called 17¾ to 18 cents, although the most influential producers do not dream of considering a sale at such a price for the time being, and are not likely to for quite some time to come. Consumers are in a waiting attitude, being comfortable for the next few months and seeing no inducement to provide for their future wants very far ahead, at present high prices. The results of such 'waiting contests' between consumer and producer have, as a rule, been disastrous for the producer, except in periods when the markets were artificially supported. If the copper market will continue in its present dullness for another month or two, there is always the possibility of one of the big producers changing his mind and cutting prices in order to accomplish sales, and, if this be done, it is doubtful whether other producers will have the courage of their convictions to hold and accumulate, for the time being, copper at the high level. The fact should not be lost sight of that for quite some time to come the bulk of the copper produced will be needed for home consumption and export, and accumulation of surplus stock will not be any burden to anybody, owing to the fact that surplus stocks were practically exhausted by the end of last year. There is probably no other staple article with as small surplus supplies as copper. The situation in this respect is so serious that in case of a serious accident, or the shut-down of a large producing mine, like the Calumet & Hecla or the Anaconda, for a period of a few months, an actual famine of copper would be possible, if business continues at the present rate.

All experts agree that copper prices in the long run cannot be maintained at the present level, but they do not agree as to the near future of the market. Some of them—and not the least shrewd—confidently expect a continuation of the present price level, as long as business conditions in this country continue as prosperous as they have been for the last three to six months.—X. in New York *Evening Post.*

Copper Coins in China.—The enormous increase in the importation of copper into China recently is due to its unrestricted coinage into one-cent pieces and cash, which operation is virtually under the absolute control of the provincial authorities. While the multiplicity of mints threatens the debasement of the currency of the Empire, the central government leaves the question of production entirely to the viceroys of the provinces. As these officials realize a comfortable margin of profit on the coinage, there is no likelihood of its early cessation, and the extensive copper importation will continue. The Shanghai Chamber of Commerce has investigated this question and has informed the diplomatic corps at Peking that representations looking to the regulation of currency should be made to the government. The chamber pointed out that as the Chinese provincial governments imagine they have a perennial source of income from the profits of the mints, they may fail to grasp the dangers of depreciation because of over-issue. It was further suggested that if restrictions be not established, foreign trade in China must inevitably suffer. In the report of the trade of China and abstract of statistics it is estimated that the output for 1904 approximated 1,745,000,000 of copper pieces and the chamber of commerce declares that by 1906, when all the mints, new and old, are in operation the output will reach in round numbers 16,413,000,000 pieces. There are 18 or 19 mints now in operation in China, but although bankers and merchants have given the subject close study, they find it extremely difficult to obtain through unofficial channels absolutely accurate information as to the present producing power of the various mints established. These conditions indicate a growing demand in China, and it is estimated that the United States now exports to this country practically one-half of all the copper that is used. The American 99.6 electrolytic copper is popular because it can be worked to advantage in the mints, and as their purchases about cover the entire importation it is apparent that the only way to increase the demand for American copper is to decrease the price. Australian copper, sold through British and German syndicates and metal exchanges, is also largely represented on this market. The importation of copper disks or blanks, the same size as the coins themselves, has been prohibited by the Chinese Government for the reason that individuals brought them in and, by using a home-made stamp, more or less crude, but nevertheless effective, established a lucrative industry. These coins circulated freely in the interior, and the authorities found it essential to suppress the competition. The customs authorities will, however, admit copper disks through the custom-house for delivery to government mints on an order from Peking. Such disks are now made in England, Germany, and Japan, and are said to be more profitable for export than ingots. There is also a demand for copper strips 2½ to 3 in. wide, of the same thickness as the coin. These strips are stamped at the mints and placed in circulation, saving time and decreasing somewhat the expense of coinage. In view of the enormous demand for copper, which it seems probable will continue for several years unless unexpected restrictions on coinage should be imposed, it would appear advisable for American copper men more carefully to investigate the conditions than they perhaps have up to the present time. This information can be obtained either through trusted representatives in China or by sending out an expert, and it is believed that the results would justify the outlay in time and expense.

Timber Preservation.—Wood, for structural use, should be cut when the sap is down, that is, in winter. If cut at this season and placed under water, it lasts well. The Poughkeepsie railroad bridge, over the Hudson river, has stone piers that stand on 12 by 12 timbers set on cribbing, all the timber-work being under water and thereby preserved. In the tropics, timber should be cut when the moon is down; if cut at full moon, or when that luminary is rising, the timber will rot in six weeks. This is a fact, for which no explanation is as yet forthcoming.

The Comstock in 1876.

Never since the world began have larger or more valuable orebodies been discovered than were uncovered in the Comstock lode between 1870 and 1876. There have been many great mines in many lands, but none have yet eclipsed what was actually discovered and exhausted on the Comstock. The history of the great lode teems with exciting incidents and romance; Arabian Nights' tales are not more entertaining nor less wonderful than the story of the heroic work accomplished by those modern genii—the Comstock miners.

The lode was discovered, almost simultaneously, at two different points, one at Gold Hill, the other a mile and a half farther north at the Ophir mine. After nearly ten years of somewhat desultory placer mining in Six-mile canyon and Gold canyon, gulches heading at Virginia City and Gold Hill, respectively, the lode itself, which was the source of the placer gold, was uncovered. At the present time the discovery would have been made within a week. At Gold Hill the quartz croppings, soft and crumbling and iron-stained, carried mostly gold, with comparatively little silver, near the surface. This, beyond doubt, would in time have attracted sufficient attention to have eventually given the Comstock the fame it has since enjoyed, but it was the discovery of McLaughlin and Reilly, of the black silver sulphide in the Ophir croppings, that was the immediate cause of the rush to Washoe. These inexperienced miners followed up a poor pay-streak, making barely a living on the steep slope of Sun peak, now called Mount Davidson. Water was very scarce, and to secure sufficient to wash their dirt in a rocker, they dug a small pit where there was a trickling spring, or rather seepage, of water. When this little basin was about four feet deep they encountered a black, granulated, heavy mineral, and, miner-like, panned a shovelful to satisfy their curiosity. The pan of black dirt was washed with difficulty, owing to its high specific gravity, but it yielded, when the black stuff had been dexterously removed, a handful of yellowish-white metal, which they were slow to realize was nearly all gold.

As they stood gazing on this prospect, and speculating on its value, Comstock put in an appearance, astride a small broncho. He caught the glint of metal in the pan, and in a moment was off his horse examining the pannings, and scratching the dirt in the pit with his fingers. Comstock was a man of quick wit and prompt action, though of no education. He realized that something unusual, and possibly of great value, had been discovered. Gazing earnestly at the miners, Comstock gravely informed them that they were working on his ranch. He claimed to have located a farm of 160 acres on that rocky mountainside, where the only verdure was a scattering of stunted sage brush, where there was no water, and but scanty thin soil. It is more than probable that the prospectors failed to realize the value of their find, or they would not have so meekly permitted Mr. Comstock to impose upon them as he did. He was given a large interest in the claim, and an additional claim was staked for his partner, Emanuel Penrod. Comstock talked loud and much about his mine, and in time it became to be known as Comstock's mine, and later, as its magnitude began to be realized, it was called Comstock's lode, and eventually the Comstock lode.

In a few weeks it was learned that the black, heavy sand that had been considered such a nuisance, and had been thrown away, was silver sulphide. The discovery was made through a sample sent to Nevada City, California. Within a day men left on horseback, in wagons, and on foot for Washoe, as the district was called. No small wonder—they were anxious to reach a camp where the miners threw away ore worth from $3,000 to $10,000 per ton.

There are few parallels in the history of mining equalling this rush to Washoe. The stampede to the Kimberley diamond field in South Africa resembled it greatly, but the more recent mining excitements dwindle into insignificance in comparison with either. A city sprang into sudden, though rude, existence on this barren, rocky hillslope in an incredibly short time. It was many miles from any other city; everything had to be freighted into the region over rough mountain roads—food, clothing, and materials of every kind. More than 6,000 ft. above the sea, the wind-swept town of tents, boards, gunnysacks, and old tin cans, presented a strange sight, and was a picture which could not be appreciated if not seen.

Thousands of eager, excited men thronged the streets, the public houses and the hovels, which latter afforded them but little shelter from the weather. Notwithstanding the numerous drawbacks, the camp grew quickly into a flourishing city of 30,000 people, while outlying districts held several thousand more. Theaters, large merchandising establishments, churches, schools, beautiful homes and public buildings sprang up as from the very ground. The hotels were elaborate and were furnished like palaces, the workmen lived and dressed like nabobs, and all went well in those days at Virginia City. For more than ten years the mines of the Comstock lode produced famously. Such orebodies had rarely, if ever, been seen before. Millions upon millions in gold and silver came from those great storehouses of wealth. Some idea of the cause of all this turmoil and frenzy of men may be gained from a statement of production from some of the most noted of the bonanzas. The figures are approximate: In the Gold Hill district the Yellow Jacket produced $25,000,000. Joe Bowers, a claim 20 ft. long, produced several millions, and this claim was afterward consolidated with the Imperial and produced several millions more; Belcher, $40,000,000, this from below 1,000 ft. from the surface; Crown Point, $30,000,000, and others, large amounts. In the Virginia City section, Ophir and Mexican produced about $25,000,000; Gould & Curry, $15,000,000; Savage, $17,000,000; Hale & Norcross, $10,000,000, and Chollar, $13,000,000. Other millions were taken from other mines in the north and central portions of the great lode. Is it any wonder that men and women became frantic in their endeavors to win a fortune while the opportunity was passing?

And yet, the greatest and richest orebodies in this wonderful lode had not been discovered, and their existence was scarcely more than suspected, and that by only a few of the keenest observers. One of these was C. A. Luckhardt. After describing what was known as the South Ophir orebody, he wrote in 1868: "The ground south of this orebody for over 1,300 ft., including south portions of the California Company, Central No. 2, Kinney, White & Murphy, Sides and Best & Belcher, has been lying idle for years. It was explored to various depths, from 100 to 500 ft. below the surface, but never with any system; and nothing can be said of its value. It is very probable that much ore exists there, but it has not yet been laid open to view. A shaft, now 300 ft. deep, is being sunk with the object of thoroughly investigating the ground for ore." The ground here described by Mr. Luckhardt covered the great bonanzas of the Consolidated Virginia and California mines, which a few years later surprised the whole world with their vast output of gold and silver.

It is impossible here to describe the legal complications over these mines, the physical conflicts of the miners with scalding water or caving ground, and the unusual engineering problems of many kinds. But mention must be made, though briefly, of the invention of the square-set method of timbering, which was evolved on this lode in the Ophir mine by Philip Deidesheimer, who was employed by the Ophir Co. to devise some means by which they might in safety extract their ore. For the first 60 or 70 ft. the vein was small, and rich, and offered no unusual obstacle to mining by ordinary methods, but at 175 ft. the vein had widened to a mass of crumbling quartz and silver sulphide 65 ft. wide. The miners had exhausted every resource; they had spliced long timbers together, and were endeavoring to stope the ground, but it was found impossible longer to continue this dangerous method. Mr. Deidesheimer visited the Ophir mine and inspected the workings. It was evident at once to him that the orebody could not be extracted by methods commonly practiced Pillars were impossible, as the ore was too soft and crumbling to sustain their own weight. He determined to drive a crosscut from wall to wall. This was done, and the cutting was timbered with posts and caps, but the caps, instead of crossing the opening from side to side, were laid on a line normal to the strike of the vein, thus forming on both sides a continuous line of caps from foot to hanging. Having successfully accomplished this, a second crosscut was cut by the side of the first, and a third line of posts and caps was set up in like manner. The sets were spragged with pieces of 2 in. by 4 in. scantling, but it soon became evident that something more substantial was required; accordingly, the 2 by 4-in. sprags were replaced by 'ties' of the same dimensions as the posts and caps, but as the caps, which met on top of the posts, occupied all of the space on the posts, the ties were supported by iron lugs driven into the posts at a proper height. A raise was now made near the center of the vein, where the ore was particularly rich. As soon as the excavation was sufficiently large, posts and caps were required. As the posts, if set flush upon the caps of the first set, would be insecure, mortises were cut in the caps after they were in place, and the posts were provided with tenons to fit into them. A few sets were inserted in this manner, when it was concluded to frame the timbers so that when in place a mortise would be formed at the point of their union. When this had been done, the square set, which has made possible the safe removal of an orebody of any size, was practically complete. The sills, butt-caps, anglebraces, and other parts of the square-set system as now known, came later, the entire system being evolved as the necessities of the case required.

It is of interest to know that the first engine on the Comstock lode was erected at the Ophir mine. It was rated at 15 h. p. and was used to run a small pump. It forms an interesting contrast to the magnificent installations which have since been built on the lode.

There is a well-founded report that early in the 70's, while James G. Fair was superintendent of the Savage mine, he had a drift run westerly from the 1,000-ft. level of that mine into the foot-wall country, and thence by a circuitous route through the Gould & Curry and Best & Belcher mines into the Consolidated Virginia—the ground described by Mr. Luckhardt as possessing great possibilities. Here the crooked drift encountered promising indications and then good ore. Unexpectedly the order was given to abandon the drift, to draw the timbers and allow it to cave, ostensibly because it was too poor to mine. The four men, Mackay, Fair, Flood and O'Brien, who afterward became the most noted of all the notable men on the Comstock, had already formed their famous coalition; quietly they began to buy up the shares of the Consolidated Virginia and California mines, a procedure requiring not only abundant money, but much shrewdness and finesse. It has been stated that the control of these mines cost the firm about $50,000, and control usually meant complete ownership in those days. When they had secured the management of the coveted mines, which required nearly two years, they attacked the problem of their development with vigor. The old Consolidated Virginia shaft was sunk as rapidly as skill and money could drive it, and simultaneously a drift was started from the Bonner shaft of the Gould & Curry, at the 1,167-ft. level, and was driven with all speed through that ground into, and through, the Best & Belcher, and into the Con. Virginia, where about 150 ft. from the line a small vein of ore was encountered. The drift was continued, and in 30 ft. the seam had widened to seven feet of high-grade ore. Further exploration proved the vein to continue and to grow both larger and richer. The shaft also penetrated the same orebody. Levels were run and sinking continued. More, and constantly more, ore was brought to light, and as level after level was run and the orebody blocked out, it began to look as if there would be no limit to the size and value of this phenomenal mass of silver-gold rock.

For more than two years the development of this, the greatest orebody in the world, continued. Millions of dollars had already been taken from it, and unknown millions remained. On one level this great mass of ore was over 350 ft. wide. It was several hundred feet high, and more than 1,000 ft. long. From it was extracted, by official report, by the first milling, over $130,000,000. This was the 'Big Bonanza.' Later another orebody, known as the Little Bonanza, was found near the first, from which $25,000,000 was taken. Over 1,400,000 tons of tailing, up to 1882, were worked over three times, and some of them are being again worked for the fourth time, now with the cyanide process, by Charles Butters.

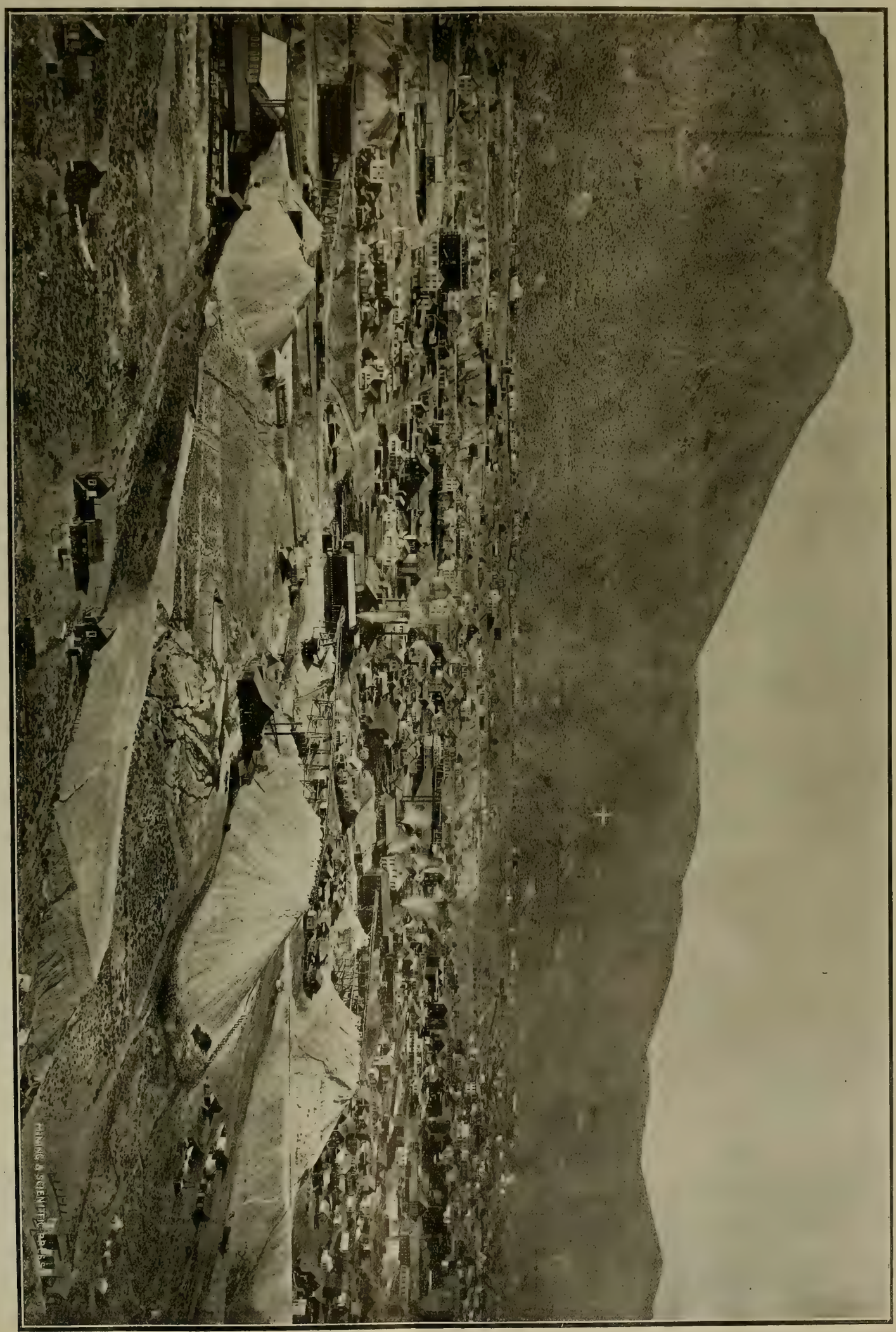
In 1875 Virginia City had grown to a substantial town, with many handsome buildings, but it did not escape the fate of most other mountain mining towns, and on October 25, 1875, a fire swept the greater portion of the city out of existence. With it went many of the elaborate hoisting and milling plants.

The illustration on the opposite page is from a photograph of the central portion of Virginia City taken about one year after the great fire. It shows a better, larger and more substantially built city than that which was burned—a tribute to the enterprise and energy of its citizens.

Several of the more prominent buildings can be seen. The nearer mines are the Hale & Norcross, Savage, and Chollar. The white cross on the mountainside is 'Point A,' the datum to which all important measurements on the Comstock have been referred. The gulch to the right of the cross is Spanish ravine. It was just this side of the ravine where the uppermost houses are seen that the Ophir discovery was made. The Consolidated Virginia and California mines are just beyond the limits of the picture on the right.

RADIO-ACTIVITY.—It is a fact that the fluorescent effects of the Rontgen rays incited Becquerel to his examination of uranium, and led to his discovery of its radio-active properties; and from this to the isolation of radium by M. and Mme. Curie, and to the splendid series of researches which have been carried out on that substance and on other allied substances, the way is clear. Rontgen's discovery was made only 10 years ago, and it is a marvelous illustration of the large sum of human effort applied to the study of science, and of the active, one might almost say the radical, tendency of the modern mind, and in so short a time we have obtained so great a body of established knowledge, and experienced so complete a revolution in our most fundamental modes of scientific thought.—*Science.*

THE COMSTOCK.—Our illustration of Virginia City is borrowed from a set of magnificent photographs of the Comstock, taken in those early days by the noted old landscape photographer, C. E. Watkins, whose beautiful pictures of Yosemite, the Big Trees, and other famous scenic points on the Pacific Coast have attracted world-wide attention. These Comstock pictures are what were known as silver prints. They are deep in tone, rich, and clear. The famous photographer, now grown old and deprived of his eyesight, lives in seclusion and poverty in San Francisco. Recently he had made for Clarence Mackay, at the latter's order, a set of handsome photographs on glass, showing the great works of Virginia City and many characteristic scenes on the Comstock when it was in the height of its glory. Copies of these photographs may be had by those who desire this pleasant reminder of the early days.



THE COMSTOCK IN 1876.

Virginia City, with Mt. Davidson in the Background. Cholar, Hale & Norcross, and Savage Mines in the Foreground.

Pyrite Smelting Without Coke.

Written for the MINING AND SCIENTIFIC PRESS by LEWIS T. WRIGHT.

From prehistoric time, copper has been extracted from cupriferous pyrite by a fire treatment consisting of alternate roasting and smelting with carbonaceous fuel and fluxes. Each roasting oxidized a portion of the sulphur and iron and each smelting removed, as iron slag from the copper sulphide, the iron oxidized in the previous roasting process; and these alternating operations were continued until a nearly pure copper sulphide was left; such copper sulphide by melting and oxidation finally became the refined metallic copper which was the aim of these combined processes. The treatment of the ore therefore was one of elimination, in stages, of sulphur and iron, and finally the sulphur; it was a gradual scraping away of the husk and chaff to find the valuable grain.

The successive oxidations and smeltings were carried on with the aid of carbonaceous fuel, which, by its reducing action, is counter-active to an oxidizing process.

Let us review for a moment the so-called English method of smelting cupriferous pyrite:

1. An ore (say 5%) is roasted in a reverberatory furnace with the aid of 15% its weight of coal.
2. The roasted ore is then smelted with the necessary flux, thereby cutting out, as slag, the iron oxidized in No. 1. This smelting is carried on with the aid of 40 to 45% coal and leaves a 35% copper matte or coarse metal.
3. The 35% matte is roasted in a reverberatory with the aid of 40 to 45% coal.
4. The partly oxidized 35% matte from No. 3 is now smelted with the aid of 50% coal, again cutting out, as slag, the iron previously ozidized; this leaves a 75% matte.
5. This 75% matte (white metal) is melted in a reverberatory furnace and by a succession of oxidations and reductions, in which the oxidations prevail, is now freed of its sulphur, leaving 'blister copper.' This is done with the aid of 60% coal.
6. The blister copper is refined by a succession of partial oxidations and reductions to fine copper.

The practice of large-scale copper smelting in the United States quickly resulted in the use of blast furnaces and converters, and by 1895 the old cumbersome, laborious and fuel-consuming method had been largely abandoned in favor of more rapid (and more economical) treatment. The coarse sulphide ore was often roasted in heaps with a little cord-wood and the fine ore was roasted in mechanical furnaces, especially if in the form of concentrate, with a not inconsiderable proportion of fuel. The smelting of the roasted ore in the blast-furnaces was effected with a quantity of coke equal to about 10% of the weight of the charge, producing a 40 to 45% matte, which was brought up to blister copper in the converters, without the expense of further fuel, except that required by the blowing engines. The sulphide fine, after roasting, was briquetted and smelted in blast-furnaces or smelted direct as a hot calcine in reverberatories. This last method offers advantages in localities where suitable fuel can be obtained at a low cost and where the ore is naturally fine.

At Keswick frequent attempts were made to smelt the sulphide ore (which was pyrite with some chalcopyrite), with hot blast but at first without increase of economy.

The coarse ore was, therefore, roasted in heaps or kilns and a smelting charge of the following average composition was made up for the water-jacket blast-furnaces:

Calcined ore	49 5%
Cupriferous pyrite	12 3%
Raw matte	8.1%
Slag	7.6%
Fluxes	22 5%
Coke	9.3% of total burden
Grade of matte produced	42.0%
Rate of running	5 49 tons per sq. ft per 24 hr.
Blast	22 oz.

This charge at first ran with extreme difficulty, the furnaces chronically and promptly freezing up. The difficulty was wrongly attributed at the time to the presence of a small amount of zinc in the ore, and it was recommended by the metallurgist then directing the smelting operations to crush the ore, to roast it in mechanical furnaces and to smelt the product in reverberatory furnaces. An adoption of this recommendation would have entailed the reconstruction of the smelter.

When I took charge in the beginning of 1897, I discovered that the cause of the difficulty was due to the top of the charge being held too low in the shaft of the furnace and on carrying the charge a little higher the trouble immediately disappeared.

The normal charge was calcined ore only and the sulphide in the above average represents occasions when by especially good roasting of the coarse ore the grade ran up beyond that required, and sulphide ore was added to the charge to bring the matte down to the normal grade. In the reverse manner, if the coarse sulphide had not been so well roasted, the grade of matte fell below the normal and had to be re-treated; and thus raw matte appears in the average charge.

The furnaces ran with remarkable regularity and ease; but the heap roasting was an unsatisfactory feature. The fine sulphide had to be roasted in mechanical furnaces and briquetted. Occasionally, when the supply of calcined ore ran short, all-pyrite charges were run; but always with the production of a low-grade matte that required two or three re-smeltings to be brought to the normal grade, of 40 to 45%. No attempt was made at that time to reduce the coke on the pyrite charges and the operation was, therefore, not economical; it seemed that, owing to the inability to secure a reasonable concentration, the all-pyrite smelting could not become an economical practice. Later, the roasting of the coarse sulphide ore was entirely abandoned and the fine sulphide was roasted perfectly and a mixture of coarse sulphide (pyrite) and well roasted fine sulphide enabled a 40 to 45% matte to be produced economically.

Other attempts to run all-pyrite charges, this time again with the aid of hot blast, did not succeed, owing to the old difficulty of low concentration; and when the coke was reduced to about 3% the furnaces quickly closed up with obstinate accretions. The practice of running all-pyrite charges was abandoned at that time, chiefly owing to the unsatisfactory oxidation of the charge. Many mistakes, as afterward discovered, had been made in the make-up of the charge; among other evils, the furnaces were overloaded with slag.

The first attempt at all-pyrite smelting failed because it was not then realized that the coke then being used could be reduced and that, being counteractive to oxidation, its presence prevented the required concentration of the pyrite into high-grade matte. With 9 or 10% coke on a charge of pyrite, a 12 to 15% copper matte ran through the furnaces like water. Being intensely hot and liquid, the ganister and fire-brick lining was eaten away and the hot, low-grade matte was frequently bursting out from the furnaces, producing explosions. The amount of air in the blast was only sufficient for the combustion of the coke.

When the first serious attempts were made to run all-pyrite charges with hot blast, with only the amount of coke absolutely necessary to keep the matte and slag running, a charge was made up, of which the following are two examples:

Cupriferous pyrite	58.7%	60.0%
Raw matte	4.3%	3.2%
Fluxes	16.6%	10.0%
Slag	20.4%	26 8%
Coke in charge	3 0%	3.5%
Copper in matte	18.7%	18 7%

The runs were of short duration because in from 5 to 10 days the obstinate accretions threatened to close up the throat of the furnace entirely and, to prevent a freeze up, the charge was modified.

It must be admitted frankly that the above-mentioned attempts at all-pyrite smelting were purely empirical and in no sense founded upon scientific reasoning. Had the experiments been varied as regards the proportion of inert heat-absorbing slag, reducing this to a minimum, no doubt it would have been then and there demonstrated that such charges would run entirely without coke and the concentration would thereby have been somewhat better. But those were not our scientific days of pyrite smelting.

However, the advantage of hot blast in the case of a composite charge of coarse sulphide and well-calcined fines was abundantly proved, and hot blast was adopted for all the furnaces. It was immediately seen that the hot blast, other conditions being equal, enabled the furnaces to run one-fifth faster with the use of one-fourth less coke and produced 25% higher grade matte. This was the result of being able to take off from the charge so much de-oxidizing carbon.

The composite charge of sulphide and well-roasted fines was then smelted with hot blast in a two-stage process. The first-stage furnaces carried the following average charge:

Calcined ore	26.1%
Cupriferous pyrite	35.5%
Flue dust	9.7%
Slag	14.5%
Fluxes	14.2%
Coke in charge	4 % of total burden
Copper in matte	31 %

This matte was re-smelted with some sulphide and calcined fine ore in a charge, of which the following is typical:

Calcined ore	31.4%
Cupriferous pyrite	8 7%
Raw matte	26 7%
Slag	13.3%
Flux	19.9%
Coke in charge	5.3% of total burden
Copper in matte	53.5%

The final average charge of all the furnaces, both first and second stage, was now:

Calcined ore	23.8%
Cupriferous pyrite	24.9%
Raw matte and flue dust	14.7%
Fluxes	17 3%
Slag	14.3%
Coke in charge	5 2% of total burden
Copper in matte	53.5%
Rate of running	8 tons per sq. ft. of furnace area per 24 hr
Blast	28½ oz

It will be seen that a notable economy of coke had resulted. The make-up of the charge on all furnaces was one that produced the smoothest running. Long campaigns were the rule. The rate of driving had increased. This was partly due to the increased blast pressure and partly to its increased temperature.

During the attainment of these results I had been endeavoring to secure some information respecting the necessary and minimum heat requirements of a copper-smelting furnace, and to ascertain the minimum amount of pyrite that must be oxidized in a given time in such furnace to furnish the heat requirements. It was evident that the amount of air required was necessarily more than that which we are in the habit of calling the 'theoretical,' meaning that which would be required to furnish the amount of oxygen indicated by the equation FeS_2 plus 5O equals FeO plus $2SO_2$, because thatre-action would cease when the tension of the SO_2 reached a degree much inferior to that indicated by the equation. Finally I became convinced that the calorific value of pyrite as a fuel was sufficient for its self-smelting; again, I made attempts to run pyrite charges without carbon fuel, but invariably failed, because of the incredulity of my staff, who were firmly convinced from past failures that it was impossible.

Finally, to convince those operating the furnaces and to induce them to effect the required result of their own volition, it was decided to order it to be done and forbid the use of any coke in the charge except that needed for starting the furnace, it being understood that if the furnaces froze up the general manager would hold himself responsible, and that the crew could have the fun of digging them out.

As a result it was quickly demonstrated that pyrite *could* be smelted without coke and monthly furnace runs with an average consumption frequently of only 0.1% coke and lower, which coke was only required to start the furnace, became the practice with a charge made up as follows:

Cupriferous pyrite	74 3%
Flue dust	9.0%
Slag	2.8%
Fluxes	13.9%
Coke in charge	0.32% of total burden.
Copper in matte	26.8%
Rate of running	8.75 tons per sq. ft. furnace area.

If it had been then convenient to convert this grade of matte direct to blister copper, the smelting might have easily stopped there. The matte resulting from this charge was, however, all re-smelted in a charge of the following composition:

Calcined ore	8.8%
Raw matte	19.4%
Cupriferous pyrite	31.1%
Flue dust	6 4%
Slag	18.4%
Fluxes	15.9%
Coke in charge	4.3% of total burden.
Copper in matte	41.8%

The average of all furnaces was:

Calcined ore	4.3%
Cupriferous pyrite	51.5%
Raw matte	10.6%
Flue dust	6.3%
Slag	11.9%
Fluxes	15.4%
Coke in charge	2.7% of total burden.
Copper in matte	42 0%
Rate of running	8.83 tons per sq. ft. furnace area.
Blast	32.2 oz.

The smelting of pyrite to 27% matte had therefore been finally carried out in blast furnaces on a large scale without the aid of coke. So far, attempts to carry it along, without the use of heated blast, have failed. It will be noted that the furnaces run very fast; that is apparently one of the conditions of success. The amount of fuel used in heating the blast is equal to about 1 to 1¼% coke.

It now having been fully demonstrated that the furnaces would run without coke with a sulphide charge of the right composition, efforts were made to force the concentration so as to produce a 35% matte in the first stage and to convert this to blister copper direct without the intervention of a second smelting stage, and to smelt the fine sulphide direct without preliminary calcination and bricking, which latter process is very expensive.

This object was achieved, but the one and only smelting stage had then to clean all the converter slags and work up all the fine sulphide ore, the flue-dust and the furnace cleanings; therefore the average furnace charge of sulphide ore became somewhat diluted to:

Cupriferous pyrite, including fine	65.6%
Flue dust	8.0%
Slag and furnace cleanings	12.1%
Fluxes	14.3%
Coke in charge	1.8% of total burden.
Copper in matte	33.7%
Rate of running	8.75% tons per sq. ft. of furnace area.

Though the furnaces would often run without coke, the slightly heavier burden of inert material and lessened amount of sulphide ore on the charge seems to necessitate the occasional use of a trifling amount of coke. However, the operation, being reduced to one stage of smelting, is much simplified, and the lower grade of the matte adds but little to the cost of the converting department, and there is the advantage that the whole of the slag is discarded at the lowest tenor of copper, and that the whole of the fine sulphide ore is smelted without previous calcination and bricking.

The two great difficulties in the practice of pyrite smelting are the obstinate and rapidly forming accretions, tending to close up the furnace, and the low-

grade matte produced. In reviewing any average of charges it is always seen that the consumption of coke varies inversely as the percentage of sulphide ore. Broadly, the addition of each 25% sulphide ore in the charge with hot blast is equal to a reduction of about 2.5% coke. The calorific value of carbon is a little more than four times that of FeS , burned to FeO and SO_2, and yet it requires ten times more pyrite than coke to keep up the smelting temperature in the blast furnace.

The following average results of large quantities smelted in several furnaces will illustrate the relative practical values of pyrite and coke in smelting:

HOT BLAST.

Percentage of pyrite on charge.	Percentage of coke.	Percentage of copper in matte.
21 9	5 2	53 5
32 1	5 1	52 4
45 7	3 4	46 3
51 5	2 7	42 0
58 5	2 3	39 6
74 3	0 3	26 8

The calorific value of one unit weight of carbon burning to CO_2 is 8.08 calories; that of a unit of pyrite or FeS_2 burning to FeO and $2SO_2$, I have calculated as 1.976 from a statement that has been made by Schnabel* that the heat of combustion of FeS_2 oxidized to Fe_2O_3 and $2SO_2$ is 2.253. This result appears to be high if that of FeS to FeO and SO_2 is correctly given in the text-books at 1.29 calories (113.6 calories per molecule).

Pyrite as a fuel has two disadvantages. Firstly, its sulphur will only burn in the presence of an excess of oxygen. This necessary dilution lowers the temperature of combustion. Secondly, its sulphur burns in a fractional manner or in three stages. On first heating, one-third of the sulphur is lost and Fe_3S_4 is left. On further heating, FeS is formed with the loss of one-sixth of the original sulphur. The loss of one-third of the sulphur at a relatively low temperature on the top of the charge is the cause of the 'hot top' so troublesome in pyrite smelting. This sulphur burns on top of the charge, and while it adds something to the temperature of the freshly charged material, it is not as efficient as if consumed lower down in the furnace or in the smelting zone. One-sixth of the sulphur is evolved between the period of the formation of the Fe_3S_4 high in the furnace and that of the matte, and must be consumed at some point lower than the first third. The FeS is now free to burn *en bloc* in the smelting zone. This long-drawn out and fractional combustion while lowering the temperature of combustion is also the cause of the troublesome scaffolding—the accretions formed of pieces and particles of the charge which, being externally semi-fused, build up from the side a dense mass of unfused material through which the blast cannot penetrate.

The other disadvantage of pyrite as a fuel is that its sulphur will not burn unless a certain *excess* of free oxygen be present. FeS is stated to have a heat of combustion of 1.29 calories, which is equal to 0.95 calorie per unit weight of the origiual pyrite. If the pyrite charge had only to depend upon the heat of combustion of the FeS which results from the melting of pyrite, the practical result (given above) that the oxidation of an amount of FeS_2 equal to 50% of the charge enables the smelting process to go on, by itself so to speak, can be compared with coke in the following way: Five-tenths of a unit weight of FeS_2 burning as FeS at 0.95 calorie equals 0.475 calorie per unit weight of charge. This is equal to 0.059 carbon or 0.071 coke with 83% carbon; in other words, the FeS component of pyrite consumed should, by a comparison of the respective heats of combustion, be equal to 7.1% coke on the charge. It would, therefore, appear from practice that the easily freed sulphur of the pyrite is not of much value as a smelting fuel.

The development of only a few years has revolutionized copper smelting, reducing it to an almost absolutely automatic process in which three agents are required, that is, cupriferous pyrite, flux and heated air. With a properly balanced supply of these three agents, the oxidation and slagging off of the iron can be accomplished in two stages and with one continued heating, and in a couple of hours the copper can be separated as blister copper from cupriferous pyrite. The ancients could only have achieved this, either empirically or by accident. They did neither. The moderns certainly should have been able to achieve it ere they did, because the results of chemistry or physics, if properly applied, would long ago have demonstrated the limits within which the process of pyrite smelting was possible.

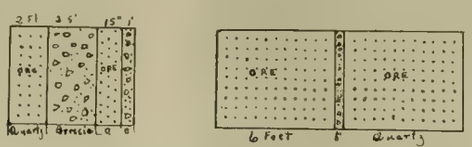
GRAPHITE varies considerably in specific gravity—from 2.09 to 2.23—according to the amount of impurities. The hardness also varies for the same reason from 1 to 2. Graphite has a metallic luster when pure, and varies from this to dull and earthy, according to the percentage of impurities. The color for the same reason also varies from iron black to dark steel-gray. It has a greasy feel, is a conductor of electricity, is impervious to atmospheric influences, is combustible only at very high temperatures, and is very soft. It is these properties of graphite that make it of so much value in the arts and adapt it to such a large variety of uses.

Lehrbuch Allge. Huttenkunde, page 101.

Fault Breccia Veins in the Sierra Madre.

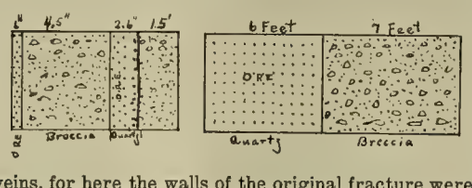
Written for the MINING AND SCIENTIFIC PRESS by RUFUS M. BAGG.

There is a type of vein formation widely distributed in the mining regions of the high Sierra Madre of Mexico which is worthy of special description. They may be designated 'fault breccia veins,' for they occupy a distinct position in the classification of ore deposits. The origin of these veins is two-fold and they are really a combination of the fissure and fault types which have been subject to extensive deformation after deposition along defined shear-zones. The classification of mineral deposits given by Kemp in his book on ore deposits includes under 'Solution Deposits' No. 6 "Veins occupying shear-zones or dynamically crushed strips along faults," as at Butte, Mont. To this class belong some of the veins of Boulder county, Colorado, described by me in the *Engineering and Mining Journal* in 1903, where, owing to irregular fracture in a homogeneous porphyritic rock, successive layers, or rather lenses



(pockets of the miners), were formed by infiltration of gold-bearing solutions. This infiltration of quartz is limited in width and thickness to the amount of space left vacant between the irregular fracture line through horizontal shear. Such conditions resulted in alternate layers unevenly distributed at various depths, roughly like the slightly overlapping scales of a fish.

Such examples are entirely different from the peculiar mineral-bearing lodes of the Mexican mountains, if we have rightly interpreted the origin of these



veins, for here the walls of the original fracture were first opened as a simple fissure along a more or less regular line. This fissure was filled with mineral-bearing quartz solutions, which became solidified and possess well-defined walls. At some later epoch, which probably came at a long interval after the first disturbance, since the successive eruptive flows vary so widely in composition and structure, very extensive faulting took place along the same disturbed lines. When this intensive movement occurred the original solid quartz was either pushed to one wall (I have found this quartz ore-bearing on both the foot-wall and the hanging in the same mine, but with the crushed portion of the breccia completing the vein-filling first on one side and then on the other), or it was split into two or more parts, with the brecciated eruptive porphyry thrust in between, or, more rarely, when the quartz vein was narrow the quartz became broken and was carried along into the breccia portion of the vein. While professional obligations will hardly allow me to mention the particular mines I have in mind while writing this article, still I give a few general sections of vein-structure illustrating this point. These are not theoretical deductions, but are exact examples of measured veins in some mines which are found in the southwest portion of the State of Chihuahua, and these conditions are by no means rare in the mountains of northern and western Mexico.

The slight mineralization of the breccia becomes more pronounced when the vein has greater width, although in most places the gold and silver are practically confined to the quartz of the vein proper.

To one unfamiliar with the character of the mines in the State of Chihuahua, it is rather surprising to see how intense has been the faulting. In many instances, as at the Reina silver mine, 14 miles south of Cusihuirachic, the slickened wall west of the ore-bearing vein stands like masonry to a height of some 50 ft. and shines like polished marble. It is not claimed by me that this vein structure is not known already, but the two-fold origin of marked brecciation along already mineralized belts is extremely interesting and instructive. This same condition has been observed in the Needle mountains of Colorado, and it has presumably a wide distribution elsewhere, but I believe that it is best illustrated in the high Sierras, where extensive faulting has taken place.

HENRY CLAY is said to have bitterly opposed the appropriation for the Sault Ste. Marie canal, on the ground that the money would be wasted. During the fifty years since the canal first went into service, the traffic has increased from 14,503 tons to the maximum of 36 million tons per annum, having a value of $355,000,000.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The mineral sample from Dyer, Nev., is calcite.

The rocks from Fort Churchill, Nev., are: No. 1, hematite (iron oxide); No. 2, brecciated jasper.

The rock from Wisdom, Mont., is a gneissic granite, containing a little white mica and altered hornblende.

The ore from near Hillside, Ariz., is magnetite (magnetic iron oxide). It is not well adapted to use as a flux, but is occasionally used for that purpose in small amount.

The rock samples from Tombstone, Ariz., are: No. 1, a very much altered granite, consisting of quartz, orthoclase, feldspar and biotite mica. No. 2 is fragmental material, largely composed of iron-stained clay.

The rocks from Copala, Sinaloa, Mexico, are: hanging wall, diorite; foot-wall, diabase. The gray rock probably the altered diorite. It contains much silica and finely disseminated iron sulphide. The rock accompanying these, and from Salvador, C. A., is diorite-porphyrite.

The interesting minerals sent from Manvel, and said to be from Soda Lake and Silurian camp, San Bernardino county, Cal., have been determined as follows: No. 1, clinochlore, a silicate of alumina and magnesia. The blue mineral mixed with the yellowish-green is chrysocholla (copper silicate). No. 2 consists of several minerals. Among them are recognized wulfenite (molybdate of lead), a bright orange-yellow mineral; chalcedony, a hard, bluish-white quartz. This is the hard portion of the white scale attached to the yellow ore. Crystallized carbonate of lime (calcite) also forms a part of this crust. No. 3 is a silicious rock, containing copper sulphide (bornite) and chrysocholla (blue). No. 4 consists principally of iron oxide (limonite), both the dark-brown and the yellowish-brown minerals. The white portion is calcite (lime carbonate). No. 5 is both hard and soft hematite. It may contain gold. No. 6 is a volcanic rock (andesite), slightly stained with copper carbonate. No. 7 is a variety of serpentine (pectolite). No. 8 is tremolite. No. 9 is diorite porphyrite. No. 10 is amphibole. No. 11 is an intimate mixture of quartz, garnet, clinoclore and iron oxide, with a little copper silicate. No. 12 is dolomitic limestone.

TUNGSTEN.—Tungsten has become of renewed interest within the last five years, owing to its wide and successful application for the manufacture of so-called self-hardening rapid tool steels. Its chief ores are wolframite, $FeWO_4$, in which some of the iron is often partly replaced by manganese, hubnerite, $MnWO_4$, and scheelite, $CaWO_4$. The ore most suitable for the production of the metal is wolframite. Although found in many places, such as Queensland, New South Wales, Straits Settlements, Bohemia, Cornwall, Spain, U. S. A., &c., it does not occur in large masses, and is often very pockety. In the pure state it should contain over 70 per cent. WO_3, but such ores are not plentiful, and the average grade runs between 60 to 70 per cent. tungstic acid, WO_3. The presence of wolfram in the tin ores at one time caused great trouble, and although Oxland in 1857 found a convenient method of separating these two metals by means of fusion with sulphate or carbonate of soda, which rendered the WO_3 soluble as Na_2WO_4 and left the tin behind, it was not until the system of electro-magnetic separation was applied to those mixed ores that the problem was satisfactorily solved. The ores, whether dressed in the ordinary manner or electro-magnetically separated, should be as free as possible from tin, arsenic, sulphur, and phosphorus, otherwise these impurities are apt to find their way into the metal made from them. The ore is sold on the basis of its WO_3 contents. At the present moment it is worth in London about 25s. to 27s. per unit of WO_3, thus a 65 per cent. ore is worth about $425 per ton. The prices of ore have varied in an extraordinary manner; at one time it could be bought for $75 per ton, and last year it went as high as $750 per ton. With regard to scheelite, this mineral is a white heavy mineral, named after the Swedish chemist Scheele, who first found tungstic acid in the same. As it is not quite so suitable for the manufacture of tungsten metal, it has a somewhat lower value than wolframite, although, if pure, it contains well over 70 per cent. of tungstic acid, not infrequently as much as 74 to 75 per cent. The world's production of wolfram ores is about 3,000 tons per annum, based on 60 to 65 per cent. ore; Queensland seems to have been the chief producer in 1904, with 1,538 tons, valued at $808,175; next probably come Spain and Portugal, with about 400 to 500 tons.—O. J. Steinhart, *Trans. Inst. M. & M.*

The Physics of Ore Flotation.

By J. SWINBURNE and G. RUDORF.

Concentration of sulphide ores by flotation was introduced by Potter in 1901, though concentration by means of oil had been already invented by Elmore. Since Potter brought forward the idea of concentration by flotation other inventors have been at work in the same direction.

Concentration by flotation is carried out by treating the crushed ore with a suitable solution, such as a strong solution of acid sodium sulphate, at a suitable temperature, which is near the boiling point of water. Part of the ore then rises to the top, and is skimmed off, or otherwise separated, and this forms the concentrate.

The explanation generally given is delightfully simple. It is said that the acid liberates hydrogen sulphide from the sulphides, and the gas then sticks to the particles and carries them up. As the acid does not act on the gangue, which in such cases is largely silicious material, the gangue is not carried up; and thus the separation takes place.

This theory does not fit the facts. In the first place, the sulphides generally treated are not attacked by the acid solution, so that there is no hydrogen sulphide evolved; or, at most, it is given off in very small quantities, which are out of all proportion to the amount of material floated. The sulphides of zinc, iron and manganese alone are attacked at all by dilute acids. It cannot, therefore, be the hydrogen sulphide that carries up the particles of sulphide. On the other hand, there is a considerable evolution of gas, but it is carbon dioxide, and carbon dioxide is chiefly given off by the gangue, which generally contains calcite and other carbonates, the carbonates being mostly produced by the weathering of the sulphide particles. According to the theory just given, this action, contrary to what is actually found to be the case, ought to float up either the gangue as a whole, leaving the sulphides, or it should at least float up the carbonates. The next point is that in most cases flotation does not take place at all until the temperature approaches the boiling point.

It seems probable that the whole matter is mainly a question of capillarity, or rather of adhesion and surface tension effects.

Consider first the capillary attraction of the solution, or the adhesion between the solid and the liquid. This phenomenon is a little difficult to examine with surface tension also coming into play. The commonest example is the case of a barometer whose tube has been well boiled, so that there is no air or other gas in the Torricellian vacuum, only mercury vapor. If the barometer is held slanting, so that the mercury runs right up to the top, it may then be put into its vertical position, and the mercury will remain at the top. The liquid mercury is then actually under considerable tension, and, in so far as it is above the barometrical height, the mercury is supported by its adheslon to the glass, which it cannot leave. This instance is particularly to the point, because it is often supposed that mercury has no adhesion to glass, which is a mistake. It also shows that mercury has considerable adhesion to itself, or, as it is usually called, cohesion. Liquids have in this sense astonishing tensile strengths—if such a term may be used. Water will stand a pull of five atmospheres. Berthelot filled a clean tube nearly full of water and sealed it up with a small air bubble. He then heated the water; and under the pressure it dissolved all the air, but on cooling the air did not again separate out; the water occupied the whole space. It must, therefore, have been under a pull in all directions great enough to increase the volume of the water; and this force was borne by the adhesion of the liquid to the internal surface of the glass, together with its own cohesion. This shows that under certain circumstances the force of adhesion between the water and glass may be very great.

Surface tension depends on the liquid itself. It is, of course, concerned with the surface of separation of a liquid and a gas; but we may treat it, to adopt the old idea, as if the surface of the liquid were always in tension like a stretched membrane, except that the tension remains the same whether the surface be increased or diminished.

If a rod is held vertically, partly in a liquid, the adhesion will tend to make the liquid run up the sides of the rod. This movement will be opposed by gravity on the one hand and surface tension on the other. Gravity, of course, tends to keep the surface of the liquid quite level, so that it meets the rod at right angles. Surface tension, considered by itself, tends to keep the surface of the liquid as small as possible, the volume, of course, remaining constant. Thus, if the adhesion, in spite of gravity, pulls the liquid some way up the sides of the rod, the surface of the liquid is increased, and the surface tension, therefore, tends to prevent its rise. If there were no adhesion the surface tension would not allow the surface of the liquid to remain level where it approaches the rod, but would round the corner so as to get the least possible surface. This tendency would be upset by gravity, so that a state of equilibrium would be reached in which the surface was by no means the least for the volume; but any further reduction would be prevented by the force of gravity, which would overcome the surface tension. If the rod, as imagined, has, to begin with, no adhesion for the liquid, the liquid has a curved surface, so that the rod stands in a sort of hole in the liquid, the hole having its top belled like a trumpet. If the rod has a little adhesion the liquid will stick to it up to a level somewhat below the surface, and the liquid will then leave the surface at an angle and begin to turn over from there. As the adhesion is increased the liquid touches the rod higher and higher and leaves the surface at a greater angle, until the surface is level and meets the rod at right angles. If the adhesion is still greater the liquid rises against the rod, the angle changing, until the liquid surface meets the surface of the rod at an acute angle in the new direction. The angle between the surface of the solid and the liquid called the contact angle thus depends on the adhesion, the surface tension and gravity. Whether it depends at all on the gas in which the whole is immersed we do not know. The surface tension has nothing to do with the solid, while the adhesion depends both on the solid and on the liquid.

Returning to the ores, the various sulphides have different adhesions. The gangue, as a rule, has very great adhesion, and cannot be floated. Even such bodies as stibnite, unless very finely ground, have too much adhesion to be floated at ordinary temperatures. The adhesion is altered enormously with change of temperature, however. This is well known in the case of taking out spots of grease from clothes. If the cloth is ironed with blotting paper underneath it, the grease will run from the hot cloth into the cooler blotting paper. In the same way, cloth that seems dry when cooled seems damper when warmed, as the adhesion or capillary attraction is reduced. A thick piece of dry bread when toasted gets quite moist in the center, partly because the water has moved in from the outside, which is hotter than the inside, and partly because the adhesion is less. In the case of ores, many of the sulphides, such as galena, stibnite and molybdenite, have their adhesion reduced enough to be floated easily near the temperature of boiling water, and though the surface tension is also reduced with increase of temperature, the adhesion is reduced much more quickly. The surface tension becomes zero at the critical temperature; the adhesion probably falls to a very low value at the boiling point.

In order to get concentration by flotation, it is necessary to have an ore whose valuable constituent is some 'greasy' sulphide,† such as galena, or at most so automatically attached to the greasy sulphide that it comes off with it. Zinc sulphide is thus easily raised by galena when intimately associated, as in the Broken Hill and some of the Vieille Montaigne Company's ores.

It is not enough to have the greasy particles; it is necessary to produce the gas bells and get them against the particles. In practical work the only gas that comes off is carbon dioxide, and this appears to come largely from calcite. But mixing calcite with an ore which has a greasy constituent will not necessarily float it; the gas is apt to come away from the particles of calcite without getting attached to the ore. It seems much more likely that the gas that really effects the flotation is generated by the action of acid on small quantities of carbonates produced by a slight weathering of the ores. It is most likely due to small amounts of carbonate of iron and manganese. These carbonates are also not attacked by dilute acid in the cold.

But there is another consideration. The question of adhesion, and of formation of adherent gas bells, is intimately connected with the air-film. Most, if not all, substances condense a volume of air or water, or both, on their surfaces. An extreme case of this is the absorption of hydrogen gas by palladium. No compound is formed here because, according to Roozeboom, the amount of gas absorbed at any particular temperature is *not* constant, but varies with the pressure. Other elements, for example, vanadium, nickel and copper, also absorb small quantities of hydrogen, but in no case does the amount of gas absorbed bear any simple atomic ratio to the amount of metal. Thus vanadium absorbs 1.3% of its volume of hydrogren, electrolytic zinc a few hundredths of 1%, copper wire 0.306 vol., ordinary porous nickel absorbs 165 vol. of hydrogen, but loses it again in two to three days, and so on. These solid solutions, occlusions, or condensations, whatever they may be, must be carefully distinguished from the true hydrides, such as those of the alkali metals. The condensation of gases on solid surfaces and the great persistence of the film is especially familiar to workers with high vacua. A glass bulb, for instance, on exhaustion keeps on giving off gas for days. If the bulb is heated as strongly as the glass will bear, the gas comes off much more quickly. This air-film seems to be intimately connected with the small adhesion for water. It may be that the air-film is itself the result of adhesion for gas, which is able to condense the gas on the surface. It cannot be any simple action of that sort, however, for time has great influence. Thus the gas comes off the inside of the exhausted globe very slowly, as already mentioned. On the other hand, small metal objects will float on water. Interesting experiments in this direction are recorded by Mayer. He floated rings of various metals—aluminum, iron, tin, brass, copper, lead and German silver—made of 1 mm. diameter wire and 50 mm. in diameter on water. The metals, however, must be clean and dry. If, after one of these rings has been sunk in water, it be dried and the experiment repeated, it will be found impossible to float the ring. After leaving it in the air for half an hour or so, it can be again floated. Similarly a heated platinum ring will not float immediately after cooling, but will do so after lying in the air for a short time. This shows that the film takes time to form. Another way of demonstrating the presence of the gaseous envelope is to sift some powdered substance which easily sinks, such as sand or ferrous sulphide, on the surface of hot water, previously freed from gas by boiling. Bubbles of gas rise from the surface of the solid particles.

Many observers have recorded the floating of perfectly dry sand on water. Evans also found that pieces of slate $1.5 \times 0.75 \times 0.1$ cm. float on tap-water, if perfectly dry. According to Simonds, the floating of the sand depends on the shape of the grains. Ladd notes the same condition, and adds that the pieces must be sharply angular. Feldspar and mica will also float under these conditions. Spring has made some experiments on the wetting of sand, and finds that it depends chiefly on the capillary-constant of the liquid and on the fineness of the particles.

However, the substances usually known as gangue are much more easily wetted than others. Thus, iron pyrite is easy to wet; that is to say, difficult to float, whereas antimony sulphide is difficult to wet, or easy to float.

A particle which is once wetted will never float, because even if a gas bubble were formed on or round it, it would not carry the solid up, as it falls through. On the other hand, if a particle has still a very thin film on it, but this is insufficient to buoy it up, it is easily conceivable that by generating gas, such as CO_2, upon it, this gas will add itself to this small air-film and eventually raise the particle. Here, again, the temperature seems to be of importance, and this probably explains why a substance like ferrous carbonate, which is not attacked by dilute acid at a low temperature, is better than calcite or copper carbonate, which are attacked in the cold.

Nothing is known about the thickness of the air-film, or whether it is the same for all substances, or, as is more likely, variable. But it is very probable that for a given substance the thickness of the film is the same whatever the size of the particle; hence, only small particles can be raised without the addition of some other gas, such as CO_2.

That the air does play an important part is shown in the case of stibnite and molybdenite. They can be concentrated by placing the ore in water nearly boiling. Apparently there is enough air on the surface of the particles to form with the steam a bell consisting of air and steam, which floats the particle. The air-film, or surface with small adhesion, also gives a bell of gas or of steam a chance of forming. The surface tension makes it impossible for a bell of steam to start, as the bell is under extra pressure due to the surface tension, the pressure of the contained gas varying inversely as the diameter of the bell. Thus a bell of air at ordinary temperatures of 0.01 mm. diameter has an extra pressure equal to a head of about 30 cm. of water. The explanation we offer—and it seems sufficient for the Potter process—is, therefore, that all solids have on their surface when dry a thin film of gas, probably air. Some of them, such as sand, quartz, carbonates, easily give up this film in water and become wet; while others, such as most metallic bodies, and especially the sulphides of lead, molybdenum and antimony, have a smaller tendency to part with the film and are not easily wetted. These can, therefore, be floated. If the air-film is insufficient to raise the particle, the flotation can be increased by the slow generation of gas on the particle. But if the particle has once lost its air-film, that is to say, got wet, it can never be raised, and no amount of gas generated on it can help matters.

To sum up, we would suggest that the selective flotation is due to the presence of 'greasy' sulphides, which have small adhesion, and that a high temperature is necessary to reduce the adhesion enough for the bells of gas to stick. It seems necessary that the gas should be produced at the surface of the particles themselves; and it is, in fact, produced by the decomposition of carbonates, due to slight weathering of the ore. If an ore that can be floated is treated with acetic acid to remove the traces of carbonate, it cannot then be floated again. The air-film also plays an important part; and if an ore is thoroughly washed or boiled in water to remove the air-film, it cannot be concentrated with acid. Some ores, such as stibnite and molybdenite, appear to have enough air on their surface to form a mixture of air and steam at a temperature below boiling point, which has enough volume to float the particles. Acid is therefore unnecessary in such cases. Of the various ores and sulphides we have tried in dilute acid or acid sulphates of soda, the following are most easily

†This effect of greasiness was well shown by the following experiment. Some ordinary steel filings, which probably had some oil on their surface, were immersed in dilute acid. Hydrogen was evolved round the particles, which were kept dry by the oil, large bubbles rose to the surface and burst, leaving absolutely dry filings on the top of the liquid. Clean new filings did not show this phenomenon.

floated, in order of merit: 1. Molybdenite. 2. Stibnite. 3. Galena. 4. Mixed zinc-lead sulphides, such as the Broken Hill ores. 5. Copper glance. 6. Zinc-blende. 7. Iron pyrite.

The last two scarcely float at all. Copper glance only floats if slightly weathered, and then only in very small amounts. With the Broken Hill ores the ratio of the Zn to Pb in the concentrate differs very little from that in the ore, only the gangue being left behind. Galena is fairly easy to float if finely ground, but owing to its rather high specific gravity very fine pulverization is necessary to float it successfully. Stibnite and molybdenite go quite easily, owing to their very greasy nature. It is interesting to note that ground malachite (copper carbonate) floats fairly well in water. It may be remembered that this mineral has a peculiar greasy feeling. Beyond this, we have not found any other carbonates that float.

This list is only roughly correct, however, and it is most probable—in fact, almost certain—that various samples of sulphides differ considerably; and if a slight weathering is necessary to produce the small trace of carbonate needed to give flotation, the 'greasiness' in itself is not sufficient to give the separation. It is, in fact, quite impossible to tell beforehand which ores can be separated by flotation.

We have not gone much into the question of merits of the various solutions used for concentration by flotation. Potter originally used dilute acid, preferably sulphuric, of about 2% strength. A saturated salt-cake solution is employed by another inventor, Delprat.*

MOLYBDENUM.—In many respects molybdenum resembles tungsten, belonging to the same group of elements. It is used for similar purposes as tungsten, though not nearly so extensively, one of the reasons being that it is more difficult to prepare in the pure state, and that its ores do not occur plentifully. The effect it has upon steel is by no means finally settled, and though it is said to be from two to three times as powerful in its action as tungsten, it is not to be relied upon to the same extent, as it is more difficult to alloy with steel, because of its liability to oxidize and volatilize. The chief ores of molybdenum are molybdenite, MoS_2, and wulfenite, $Pb\,MoO_4$, both of which are comparatively rare minerals. In the pure state it contains 60% of the metal and 40% sulphur, and if testing 90 to 95% MoS_2 is worth from 1s. to 1s. 3d. per lb. in London. Parcels are often sold cheaper, as there really is no fixed price for the mineral, sales generally being a matter of negotiation, as is the case with so many of the rarer minerals. According to some manufacturers, wulfenite is the best raw material for the preparation of suitable metal. It is first melted with soda ash and carbon, resulting in the formation of metallic lead and a fused mass of molybdate of soda, from which molybdic acid is separated. The latter is then reduced with carbon in crucibles very much like tungsten, yielding a gray, metallic powder of about 95% purity, with 2 to 3% carbon and a considerable quantity of undecomposed oxides, by no means an ideal product. The present price of metallic molybdenum, either as metal or in the form of a ferro-alloy, is about 5s. to 6s. per pound in London.—O. J. Steinhart, *Trans. Inst. M. & M.*

ALUMINUM AS AN ELECTRICAL CONDUCTOR.—This is one of the most promising fields for aluminum. As compared with copper, the cost of transportation and erection of aluminum conductors is less, the durability greater, and the cost of maintenance lower. Contrary factors on the part of aluminum conductors are difficulty in making joints, sag due to large co-efficient of expansion, and insufficient strength of the wires in sizes ordinarily employed for telegraph and telephone lines. A small percentage of copper added to aluminum would increase the strength of the wires, but somewhat impairs their conductivity. However, there have been some large installations of aluminum conductors for transmitting light and power to important manufacturing and railway plants.

USES OF FULLER'S EARTH.—Abroad the principal use of fuller's earth is for fulling wool, but in America the greater demand is for deodorizing, bleaching and clarifying fats, oils and greases. In this country the largest consumers are the manufacturers of lard and cottolene. For the purpose of clarifying lard and cotton-seed oil a small quantity, 2 to 3%, of fuller's earth is ground to a fineness of 100 to 120 mesh and is added to the hot oil. After a thorough agitation the hot liquid is passed through a filter press, and when the earth and coloring impurities have been removed the oil is nearly white.

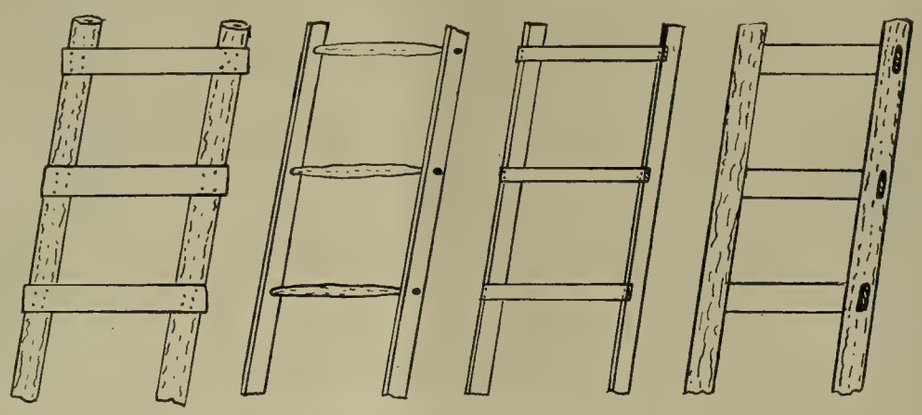
* A paper read before the Faraday Society, December 12, 1905.

Making Mine Ladders.

Written for the MINING AND SCIENTIFIC PRESS by MATT. W. ALDERSON.

The first requisite of a mine ladder is strength. In this respect it differs from the ladder of a carpenter; for such a ladder must be light, that it may be easily moved from one place to another. A mine ladder should be strong that it may be ready for any emergency, such as the necessity of several men standing upon a short section in the placing of machinery; carrying an injured workman to the surface; withstanding rough usage, the effects of blasts, the fall of tools, and even small rocks.

Where a manway is on an incline it may be run as a continuous ladder from one level or station to another. It requires much less strength to climb a ladder on an incline than when it goes straight up, and, if a man needs to rest on such a trip, there is no tax on his arms, the weight of his body resting naturally on his feet. In such a position he may do many things, should occasion arise, with little danger of falling, whereas nearly all of his strength would be required on an upright ladder to enable him to retain his place. Three men were going down a vertical ladder in a Montana mine. The top man in some way lost his hold and fell, knocking the two men below him into the sump. Wherever it can be, a ladder should be so constructed as to preclude the possibility of such an accident. In compartment shafts, where the ladder is of necessity vertical, lifting doors are frequently placed not further apart than 50 ft., being a protection in some measure and affording checks on air-currents, as well as partial protection from smoke in case of fire.



Types of Mine Ladder.

The best uprights for a ladder are pine poles four to five inches in diameter at the large end. Two by four inches are fairly good, but should not be used when one can get heavier and stronger material. If sawed timbers are used, three by four inches are good size. Occasionally, one sees a ladder in a mine with slats two inches wide made from one-inch lumber which has been surfaced on one side and which, when seasoned, is just about three-quarters of an inch thick. These are not of sufficient strength. They will wear down quickly where many men step on them every day with hob-nail shoes. Moreover, such slats break easily, and it is necessary to renew them too frequently.

It is true that in large mines the ladders are used very little, but it is imperative that they be strong and kept in good condition, for the demand is severe on them, if anything goes wrong and the men make a rush to get out of the mine. A slat should not be less than three inches wide and 1¼ to 1½ in. thick.

In making a ladder, lay the two poles side by side, crowning side up. Commence at the large ends, which should form the bottom of the ladder and should be cut off square. Now take a measure and mark each foot along the poles with a saw-cut about one-eighth of an inch deep. Nail on the bottom slat and the slat one foot below the top, and then the intervening slats, all being of the same length, 16 or 18 in. Where possible, the ladder should be built from the bottom. The first length is put in, the top slat not being nailed on. The next length is let down to rest squarely on the top of the length below. Side strips are then nailed on, thus splicing the two lengths and making them one. The slat left off the bottom length is now nailed on.

Many persons 'gain in' the ends of the slats. This is waste of effort and a great inconvenience when it is necessary to renew a slat. A mine is nearly always damp, the nails rust, the gained-in portion swells, and one will need several tools to get a broken slat out and the bearings clear for a new slat. Where the slat is nailed on flush, a cracked or broken one is sawn through about half way between the uprights, and a few blows of a hammer loosen it, the slat acting as a powerful leverage in drawing the nails. A new slat is put in place of the old one and just where it belongs, the slight saw-cut being a mark easily found in the dim light of the mine, even if the ladder is covered with dirt.

In putting ladders in raises, I have found it a great convenience to lay the ladder out on the surface and put it together in the mine. It is much easier to carry a long pole around corners and up into a raise than a made ladder, and when the places for the slats are marked as I have indicated, the ladder is put together almost as rapidly in the mine as it would be on the surface. Stand the uprights on the mine level. Nail on the bottom slats and climb up the ladder nailing on the slats as you go. Hoist subsequent lengths to place above the first. If the ladder is too long, fasten it temporarily to the bottom part with wire or rope. As soon as space will permit, lift it to place, splice it to the part below and secure it to stulls or other timbers as if you expected it to remain there to the end of time.

The poorest ladder for a mine is of the style used by carpenters, with wooden rounds an inch or more in diameter. When the rounds are of iron gas-pipe an inch or more in size the ladder is all right for most mines. Where the rungs are of bar iron, as in the mines of Australia, the ladder is excellent as a permanent ladder where there is no chance for falling rock striking a rung and bending it so as to destroy the spacing of the steps. In some of the mines of Butte, however, ladders with iron rungs would soon be nothing but death traps. In such mines it may be advisable to have slats gained or dovetailed in. A preferable ladder, however, is one made wholly of wood, of a type similar to a carpenter's ladder, only with rungs 1¼ by 3 in., mortised in. Such a ladder fastened with wood or non-corrosive metal would be something to depend upon always.

A light ladder should be made for sinking, to connect with the permanent ladder. This may be made of two by four inches, or poles two inches in diameter. The steps should be 12 in., as in the regular ladder; 14 in. is the regulation distance between rounds on a carpenter's ladder. A hod-carrier uses a ladder with 10-in. step. This is all right for a mine where it is used continuously by men who carry loads up and down, otherwise the 12-in. step is preferable; and, as habit exercises a powerful influence on men and it is annoying, and might be a source of danger, to climb a ladder the steps of which are longer or shorter than one is accustomed to, all ladders in a mine should be uniform.

The slats should be firmly nailed with 16-penny nails. The ladders should be securely fastened to timbers firmly set, with solid bearings at every available place. Most persons make the mistake of thinking the ladder will be used but a few years. It should be put in to be solidly in place, if some one needs to use it 50 years hence. No one ever makes a mistake in doing his work just as thoroughly as it is possible.

ALUMINUM PAPER is being manufactured and placed on the market, its special application being as a substitute for tinfoil. It is not the so-called leaf aluminum, but real paper coated with powdered aluminum, and is said to possess very favorable qualities for preserving articles of food, for which it is used as a covering. Chemical analysis have proved that aluminum paper contains but few foreign substances; occasionally it may contain up to two per cent of iron, but never any arsenic or other poisonous metals. Hence, it appears that the powdered aluminum used for the manufacture of this paper is relatively pure. The paper used is a sort of artificial parchment, obtained through the action of sulphuric acid upon ordinary paper. The sheets are spread out and covered upon one side with a thin coating of a solution of resin in alcohol or ether. Evaporation is precipitated through a current of air, and the paper is then warmed until the resin has again become soft. Powdered aluminum is then sprinkled upon it and the paper is subjected to strong pressure to fasten the powder upon it. The metallic covering obtained is neither affected by the air nor by fatty substances. Since aluminum paper is much cheaper than tinfoil, it is believed that it will become, when generally known, a strong competitor of the latter.

SIMPLON TUNNEL.—On January 25 the ordinary passenger service through the Simplon tunnel began, the first train entering the tunnel at 8:56 A. M. from the north and leaving at 9:33 A. M., says the London *Electrical Engineer*. The best of conditions prevailed so far as temperature and other matters were concerned. The train consisted of an engine and four passenger coaches, containing a number of eminent personages. The boring of the tunnel has occupied nearly seven and one-half years, and the estimated cost originally fixed at $11,750,000 has been far exceeded.

Air-Hammer Rock-Drills.

Contributed to the MINING AND SCIENTIFIC PRESS by EDWARD A. RIX.

It is evident from the way in which air-hammer rock-drills are invading the mining field, that they must be given a serious hearing. Because they weigh less than 20 lb., and may be held in the hand during operation, is no reason why they are not entitled to respect. When I first heard of them, I, in common with many others, thought that they were merely an off-shoot from the frenzied claims of pneumatic-tool builders, who were trying to find an outlet for their over-productions.

A letter two years ago from some young men at the Black Oak mine, who were selling the Little Wonder drill in that territory, led me to invite them to call on me at San Francisco and show me what they could do. This they did, and I learned a great deal about rock drilling in a very few minutes. I realized that piston rock-drills had a rival in the field.

Manufacturers have always known that a light-weight drill was wanted in mining, and machines have been built with cylinders of only 1½ in. diameter. But they weighed 75 or 80 lb., because they were arranged for column mounting and all had rotating motions. It seemed to be accepted as gospel that in order to drill to any depth, the hole had to be round, and in order for it to be round, the steel had to be rotated; and that this rotating mechanism really determined the character of the machine, increased its weight and forced it to be mounted. When I saw an 18-in. hole neatly drilled in very hard granite and as round as possible, by a simple turn of the wrist with a 17-lb. machine held in the hand, and with good speed, I saw that the pneumatic hammer had a future.

There are four of these machines upon the market today adapted for mining work; named in the order of their introduction in mining, we have: the Wonder drills of the Hardsocg Wonder Drill Co., Ottumwa, Iowa; the Shaw Eclipse Air-Hammer drills of the Shaw Pneumatic Tool Co., Denver; the Little Jap drill of the Ingersoll-Rand Co., New York, and the Murphy drill of C. T. Carnahan Mfg. Co., Denver.

It is always interesting after a machine has proved a success, to know how it first came to be produced, and I have been at some pains to try and get this information, so that it might be of record, but I find that the commercial atmosphere which environs the whole subject is so cloudy that it is hazardous to make a positive statement. It is a well-known fact that short holes have been drilled in stone, with pneumatic tools, ever since a chisel was first put in them. This has led many to claim that they were the originators of this style of rock-drilling, but we need not treat such claims seriously. From all I can learn, the real originators are Martin Hardsocg, of Ottumwa, and C. H. Shaw, of Denver, and because of the rival business relations with each other it is difficult to determine which of these persons was the originator. It may be possible they arrived at their results simultaneously.

I have asked Mr. Hardsocg to give me his statement in the matter, and he writes me as follows:

"I believe that I am the first man that ever made the air-hammer drill a success, and that I am the originator of the idea of using it for drilling holes over 6 in. deep. I found out that pneumatic hammers were being used for drilling plug and feather holes in rock. The turning of the bit was done with a wrench and the dust was blown out by a small hose attached to drill, and direct air through the hose served to blow out the cuttings while the tool was in operation. The idea occurred to me that if a hole were made through the bit so the air could pass through, the same would serve the purpose much more satisfactorily, as the hose could not blow out the dust over 6 in. deep from the top of the hole and it therefore would not answer for drilling holes from one foot to five feet deep. At that time I was not aware that Leyner was making a large drilling machine with hollow bits and using water for the purpose of getting the cuttings out of the hole being drilled. I also claim to be the originator of making a bit with more than four corners. This was designed for the purpose of making it less difficult to drill a round hole with so rapid a striking tool as the pneumatic hammer, and to avoid turning the drill by a wrench, I simply turned the bit with the hammer, which made it far more convenient. In place of making a turning device for turning the bit, as is commonly used on most all power drills, I simply turn the hammer, bit and all together, doing the turning at the same time that the drill is fed into the rock. The air-feed was invented by our foreman, C. J. Smith. At the beginning, I bought the hammers from different pneumatic hammer manufacturers, and the last I had made was by Mr. Shaw of Denver, by inducing him to alter his hammer for my special purpose. I soon after manufactured them myself, and I also made further improvements in the construction of the hammer, forging the whole hammer, handle and all, out of one piece and putting on a rubber flexible handle to avoid vibration to a man's arm."

Mr. Shaw claims that prior to the time spoken of by Mr. Hardsocg, he had a hammer drill in operation at the Elkton mine at Cripple Creek. These statements must constitute, as far as I am concerned, the history of the beginning of these machines.

In construction, all of the drills have about the same weight and exterior appearance, and they are all alike mechanically, except the Little Jap, which has a valve actuating mechanism, while the others are valveless hammers, or vibrators, having a piston which is its own valve and which is the only moving piece in the whole mechanism. These valveless machines are economical in the use of air, because the live air at full pressure acting upon a small area of the piston or hammer which causes the backward stroke, is, after the backward stroke, again used expansively at a lower pressure upon the whole area of the piston, to give the forward stroke. The piston has a diameter of 1⅝ in. and an approximate width of 1⅞ in., and makes about 2,000 blows per minute. The end of the piston is hardened and impinges directly upon the end of the drill-steel which is held loosely in the chuck and by reason of its being hexagonal, the steel may be rotated slightly back and forth as the hammer is twisted by the hand.

All of these hand-drills weigh about 17 lb., and consume, let us say for safety, 25 cu. ft. free air per min., although claims are made for 17 cu. ft. They should be operated at about 80 to 90 lb. pressure per square inch.

It was early learned in the piston rock-drill business that while a short stroke did good work in drilling, it was useless because it would not throw the drill dust and cuttings, or the mud out of the hole, and the bit would soon become clogged and useless. Leyner overcame this by using a hollow steel and forcing water through the steel to the drill-point, thus not only keeping the cutting point clean and giving it great advantage for rapid drilling, but the water kept the drill-point cool and preserved its temper, thus making it do more work. The hammer-drill manufacturers used air in the same manner that Leyner used the water, and used the same hollow steel but they raised a large amount of dust, which at first threatened to drive the machines out of the mines, but objections to this are growing fainter and fainter and like the objections to the headache-producing fumes of giant powder, will soon be heard of no more.

This does not mean that the manufacturers are not trying to remedy this evil, for they are trying their best. The Murphy people provides a sponge which may be readily fastened around the drill-steel, and being saturated with water is used like the old-time mop in hand-drilling, and indeed a regular old-time mop can also be used effectively; water thrown from a can or small hose will also kill the dust.

The Little Wonder Company provide a simple attachment for the end of the drill so that water may be discharged through the hollow drill, and if a water supply from pipes or hose is not available a small container, holding 10 gal., is supplied and connected to the air-pipe, so that the water is forced from the container through the drill-bit.

All of these various devices, however, mean attention, thought and care on the part of the miner, and the general result is that he leaves them all out and endures dust; and right here, it might not be amiss to suggest that the simplest solution of this dust problem would be a practical, inexpensive head or face gearing of some kind, to be worn by the miner; whoever will perfect such a device will find a ready market for it, because these hammer-drills have come to stay and conditions will have to be met.

At first, the drill-steel was simply a tip about six inches long welded to stay-bolt iron, which has a small hole throughout its length. This was done because drilling the steel was expensive; in consequence, the drill was round, about ⅞ in. diam. There proved to be objections to the round shape, the welds were always breaking, so that at present the all-steel hexagonal shape is preferred, and means have been found to render them not too expensive. Some find that solid hexagonal bits will do their work well enough, and that by using water freely and spooning or gunning the hole frequently, satisfactory work is done, but this is for the most part in the softer rocks or in sinking, where there is sufficient surface water to keep the hole flooded, or in the uppers where the dust will gravitate away. Nine-tenths of the machines, however, exhaust the air through the steel to clean the hole. The first bits were made with parallel ridges like a stone mason's dressing hammer and files were used to sharpen them. Then these ridges were made radial and shallow, and still sharpened with a file, but these methods were soon abandoned for a radial-toothed bit that can readily be sharpened with the proper dolleys. Six teeth seem to be the favorite number. It is evident that the less the teeth, the greater the angle of rotation for the machine—in order to make a round hole, but inasmuch as it is easier to operate the drill the smaller the angle of rotation, there quickly developed bits with many teeth. But here again, it was found that the greater the number of teeth, the smaller they had to be, and the harder they were to sharpen, and thus gradually was developed the six-tooth bit as a compromise. One manufacturer has developed a machine for sharpening these drills which is convenient and will save time and expense where a number are at work.

The hose used is one-half inch pneumatic hose with plain couplings or lightning couplings, as may be desired.

At first these machines were used with a valve or trigger that had to be held open by the hand or by pressure, but it tires the operator, and it is generally conceded now that a plain shut-off valve similar to those used on standard mining drills is preferable.

The first objectionable impression created upon seeing these hammer drills in operation, is that the vibration and jarring would soon put either the operator or the drill out of commission, but such is not the case. There is no more vibration than there is at the feed-screw handle of a standard mining drill, or than is encountered in the many thousands of pneumatic hammers used in industrial work. Of the two, I imagine the mining hammer is preferable to a caulking or riveting hammer, for it does not irritate the ear as much.

To overcome, however, this objection, and to provide a convenient means of holding the drill for uppers or for holes beyond the ordinary reach, the pneumatic feed has been invented; this, I understand, is the occasion for the first infringement battle to be soon fought between the patentees. The pneumatic feed is simplicity itself and consists in fastening the hammer to a small piston-rod which has a motion of from one to three feet in a small pipe cylinder. The compressed air behind the piston-rod keeps the drill against the rock steadily, and automatically follows the progress of the drilling. It also absorbs all the vibration. In most instances, it requires a mounting and this is done with a small column, arm, and clamp, the same as a piston-drill. These appurtenances, however, are so light and small compared to those used for piston-drills that they may be set up in one-third the time.

What I have heretofore said, applies in general to the light hand-machine which I consider to be the one most generally applicable to mining. The success, however, of the hand-drill, has led the manufacturers a step further, and they have produced a slightly heavier machine which is mounted on a column, arm, and clamp and which is calculated to dispute the ground with the standard baby drills of the regular type, but inasmuch as it has by no means yet been proved that they offer advantages over the standard baby drills, I shall let this part of the subject alone.

The advantages of the hammer-drills appear to be:

1. They are extremely simple, having, in general, only one moving piece.

2. They require little, or no repair if properly oiled, thus saving much time and expense.

3. Requiring but a moment to change bits, clean a hole, or to begin a new hole, at least nine-tenths of the labor paid for, is for drilling, while in the piston-drills, the actual drilling does not occupy more than two-thirds of the time and probably not over one-half.

4. The destruction of drill-steel and breaking and dulling of bits for the same footage of holes is not over one-half that caused by the standard drills.

5. It is economical in power, each machine requiring one-half the air consumed by the smallest standard piston-drill.

6. It can be used in extremely close quarters, where it is impossible to use a piston-drill or even to swing a hammer.

7. It does not require any special skill to operate it. In a half day's time an unskilled laborer will find himself perfectly at home with the machine and will be doing satisfactory work. And herein lies one of the great values of this machine. It takes a real miner to use a hand-drill, or run a piston-drill, particularly the latter, for only experience can overcome the difficulties of seamy ground, fitchered holes, or teach a man how to start a hole, set up a column, and determine the speed, pressure and stroke for a piston-drill. It is now possible for a layman to do a little prospecting with unskilled labor, as far as removing rock is concerned, and the menace of combinations of skilled labor cannot be as effective as it might otherwise be.

8. In rock suitable for the operation of these hammer drills, the investment for drills and machinery and the power required is about one-half that necessary for the standard drills. Thus it gives prospectors of limited means an opportunity to instal a power-drilling plant, which will save them time and energy in determining the value of a mine.

In averaging the claims made by the manufacturers of these four air-hammer drills, I find that they claim in average granite or quartz an inch and a quarter hole can be drilled at the rate of three to four inches per minute, and in hard sandstone or limestone, or similar rock, from seven to ten inches per minute. These statements are misleading, for the speed of drilling diminishes with the depth drilled, for a good mechanical reason, independent of any difficulties that a deep hole may of itself offer. The longer the drill bit, the heavier it is, and consequently the more power it takes to overcome its inertia, the less effect the blow will have. There is, then, a limit to the depth which these machines will drill economically. Just what it is, I do not know, but it is about four feet. The standard rock-drills are not subject to this limitation.*

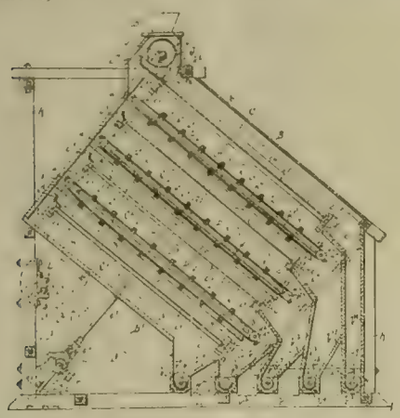
*Abstract from paper read before California Miners' Convention.

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 6, 1906.

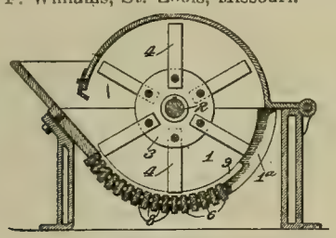
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

SEPARATOR.—No 811,192; F. R. Willson, Jr., Columbus, Ohio.



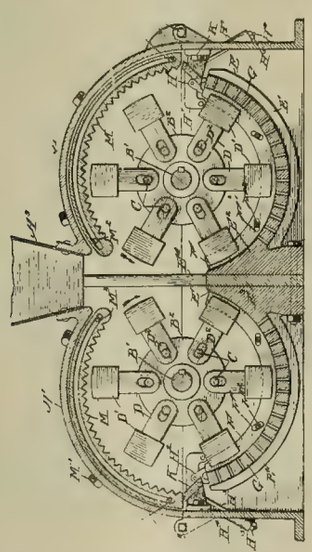
In a mechanism for screening ores or other material, the combination of the series of inclined superposed screens, the pair of longitudinally reciprocating actuating devices arranged one at either side of series of screens and pivotally connected to each screen of series near its center, the ends of each screen being free to vibrate about the axis of its pivotal connection with reciprocating device independent of the vibration of the ends of any other screen of the series, reciprocating actuating device being arranged to bodily reciprocate series of screens in planes at an angle to the planes of the flow of material along the screens and the series of vibrating sustaining devices each flexibly connected to one of screens and also connected to a relatively stationary support.

CAGE FOR CRUSHERS AND PULVERIZERS.—No. 811,679; M. F. Williams, St. Louis, Missouri.



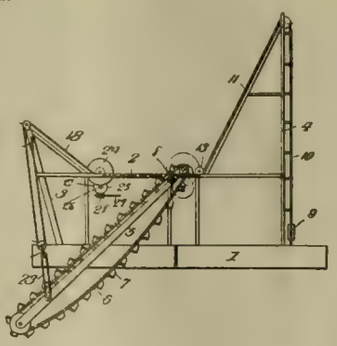
The combination with a support having curved groove, of cage-bars having reduced ends projecting into groove whereby shoulders are provided on the cage-bars adjacent grooves, an inner-ring mount co-operating with shoulders, and means independent of ring-mount for holding cage-bars spaced apart.

CRUSHER.—No. 811,671; P. L. Simpson, Chicago, Illinois.



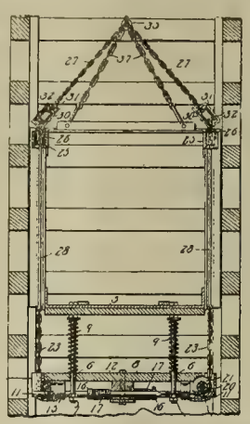
In crusher, combination with hammers, and means for rotating them about adjacent centers so as to crush material between them, of means for inserting material between hammers so that it will be crushed, dividing-block located beneath points of nearest approach of hammers to each other, and grate-bars extending in curves from block and underneath axes of hammers.

DREDGE.—No. 811,683; Frank Yeoman, Oroville, California.



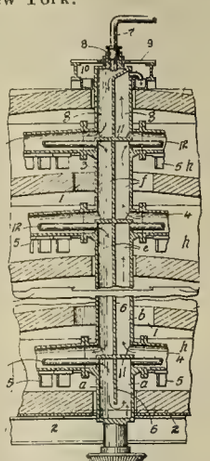
In a dredge, combination of float, vertically swinging frame mounted therein, and endless excavator mounted upon frame, series of side-line drums, driving-shaft for drums, power-shaft, longitudinal shafts geared to driving and power shafts, counter-shaft, frictional gearing between ends of counter-shaft and longitudinal shaft, means for driving counter shaft, main power-shaft, counter-shaft geared to latter and variable-speed driving connections between latter-mentioned counter-shaft and first-mentioned counter-shaft.

SAFETY DEVICE FOR MINE-CAGES.—No. 811,893; I. M. Adams, Shenandoah, Pennsylvania.



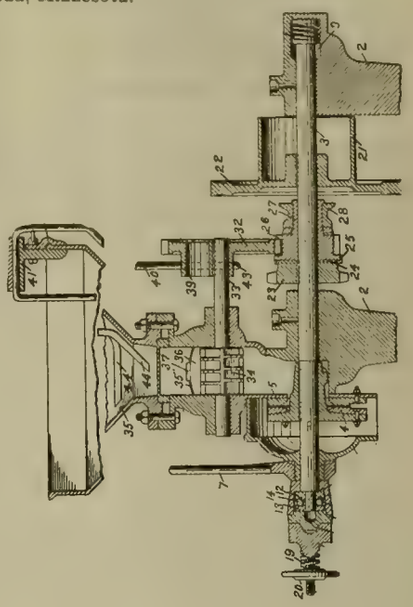
In a safety device for mine-cages, supporting-bar arranged below floor of cage, springs tending to depress bar, spring-projected locking-bolts carried by bar and arranged when projected to engage horizontal sills of shaft-timbering, and bolt-retracting connections between bolts and hoisting-cable, members being placed under sufficient stress to retact bolts and slightly elevate carrying-bar, cushioning-springs of latter serving as compensating means for bolts.

ROASTING FURNACE.—No. 811,643; F. Klepetko, New York, New York.



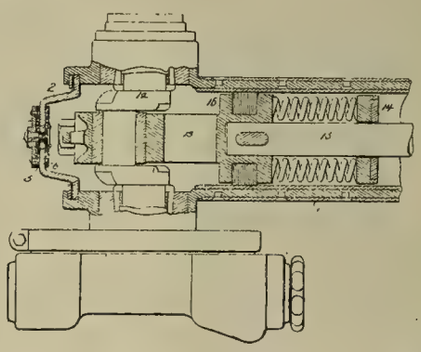
In furnace having plurality of hearths, hollow rabble-shaft passing through hearths and having passage way divided into contiguous intercommunicating conduits, series of hollow arms radiating from conduits and extending into several hearths, series of chambers separated by transverse partitions distributed throughout each conduit, distributing pipes leading from respective chambers and opening into adjacent arms, and feed pipe adapted to discharge cooling medium into one of conduits at point removed from point of intercommunication between conduits.

GRINDING-MILL.—No. 811,945; C. N. McLaughlin, Winona, Minnesota.



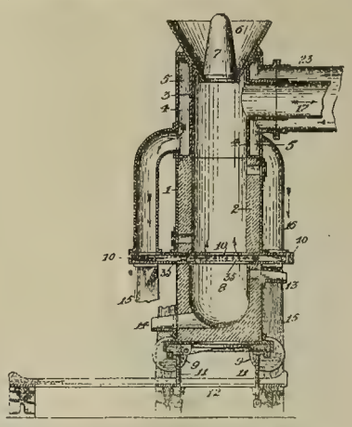
In grinding-mill combination, with fixed bur, of longitudinally movable shaft, bur provided thereon and normally in co-operation with fixed bur, spring normally tending to move shaft lengthwise and separate burs, ball bearing provided at one end of shaft to receive endwise thrust thereof, housing or cage for bearing, yoke having central bearing on cage, springs connected with ends of yoke on each side of bearing and arranged to overcome tension of first-named spring to hold burs in grinding engagement with one another, and mechanism for relieving pressure of yoke-springs on shaft to allow first-named spring to move it lengthwise and separate burs.

ROCK-DRILL.—No. 811,685; T. E. Adams, Cleveland, Ohio.



In a drill, combination of movable parts causing air-current to pass through drill-barrel causing feed of lubricant therethrough to lubricate part regardless of inclination of barrel, and valve mechanism in rear end of drill and means for adjusting valve mechanism to regulate direction of flow of air-current according to position of drill-barrel.

SMELTING-FURNACE.—No. 812,083; A. R. Partridge, San Francisco, California.



In combination with smelter, having double wall near its upper end forming hot-air space, outlet-pipe communicating with interior of stack, inlet-pipe concentric therewith and communicating with hot-air space, an exhaust-fan in connection with outlet-pipe, and fan-blower in connection with inlet-pipe.

Mining Summary.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

LONDON, February 7.

The total output of the mines in British Columbia for 1905—reported at about £4,000,000—is some £400,000 in excess of the previous year. There was less gold produced, but a larger proportion of the baser metals.

From another British colony—Western Australia—the production for the past year is double in value that of British Columbia, in the precious metal alone, the total in fine gold being 1,955,316 oz. Compared with 1904, a decrease is noticeable of nearly 28,000 oz. A writer, regarded as an authority, who not seldom poses as the candid friend, puts his views on the present outlook of West Australian gold mining very tersely. He says: "So far as I can see there is only one mine that has not reached its zenith." An apologist, in reply, points out that in most cases the grade of ore now being treated approximates the general average grade of the mines, and is not picked, as was done formerly, to get big results. The feeling of the market is expressed in the fact that, taking a list of over 50 mines in Western Australia, there was only one rise of note during the three months to December 31 last; that was the improvement of £1 1/16 in Kalgurli Gold, to 9 1/16.

In spite of the steady decline in the average grade of ore crushed on the Rand, the dividends paid in 1905 amounted to £5,033,000, as against £3,880,000 in 1904. The increase is, of course, due largely to the introduction of Chinese labor and to other means of lowering working costs, so that a larger proportion of low-grade ore was milled at a profit. While no voice is raised as to the efficiency of the managements on the Rand, the methods adopted by the controlling financial firms are the subject of conflicting comment. No less an authority than Mr. H. C. Hoover is reported to have said on a recent occasion that "the whole South African scheme of organization is a shift to avoid responsibility to, or interference from, outside shareholders." As a counterblast to this pungent criticism the *Mining World* of last week may be quoted. The editor's remarks are to the effect that many crimes have been laid at the door of the Rand industry, but there is one that even shamefacedness has never had the audacity to allege—that of withholding information from shareholders. The views thus strongly expressed come a little curiously from a paper which publishes week after week voluminous reports of developments received from Western Australian and Indian gold mines and which rarely notices such reports from the Rand, for the very cogent reason that in the case of the leading South African mines they are conspicuous by their non-existence. The monthly statements of crushings do not convey all the information which shareholders in this country look for. They wish to know whether ore reserves are being blocked out to keep pace with, or ahead of, the monthly millings, and in this essential point they are left in the dark until the annual reports are issued. It is a long time to wait; meantime shareholders are at the mercy of vague rumors, often started by unscrupulous punters on the market. On the Chinese labor controversy it is clear that opinion even in South Africa is far from unanimous. As a fresh contribution we have the De Beers protesting that "so long as the De Beers Company exists the labor employed will be those mostly of British descent so far as white men are concerned, and the natives of the country"—a sentiment which was received with "loud applause" by an audience composed of De Beers staff and work-people. On this subject it is interesting to note that the salaries and wages paid to the whole mining industry of the Transvaal amounted in 1905 to £8,996,121, of which £5,660,493 went to the whites.

Large specimen lumps of fine-grained lead-silver ore from the Transvaal are on view in London, running, it is said, to 80 oz. silver per ton. They certainly present the appearance of having been taken from a powerful vein. The mine, which is undergoing preliminary development, is about 15 miles from Pretoria, in the direction of Johannesburg.

An important development is announced on the property of the Nerchinsk Gold Co., Ltd., probably the only English company operating in that part of eastern Siberia. The company, formed in 1901, is a reconstruction of the Siberian Goldfields Development Co., Ltd. The £1 shares were issued with 18s. credited as paid up. It is a company possessing mineral rights over a huge area—6,000 square miles—with very little available cash (at date of the last annual report) to prove its potentialities. Crushings have been delayed owing to difficulties in transit of the machinery, the railway having been congested during the Russo-Japanese war. The development in question has exposed a mass of ore 150 ft. in width, going an average of 12 dwt. gold per ton. The value of the ore so far opened up is estimated at £570,000, which would leave a net profit, allowing for 14s. as the cost of mining and milling, of £350,000, or about one-third of the nominal capital of the company.

A perusal of the various financial year-books at this season, if it does not lead to good resolutions for the future, serves at any rate to remind us of lost opportunities in the past. Our sense of failure brings home the fact that we have neglected to profit by the maxims laid down for the guidance of our tender years. A practical application of those high moral precepts would have brought us many of the joys of life we have missed. Had we not dangerously delayed to profit by the tips of confiding friends and lacked punctuality in "quietly picking up low-priced mining shares sure to go better by next account," we should have purchased Bostons at 17s. 6d. two years ago and sold them lately at £7; Anacondas at a little over £3 in 1904 and sold at £14 15s.; Camp Birds 15s. in 1902 and sold the following year at £2. With sufficient pluck we should have bought Esperanzas in 1904 at 18s. 9d. and sold them a short time back at over £6. Two years ago we should have bought Rio Tintos at £38 3/4 and sold them later at £68. There is another side to the shield—but we must not spoil good sport.

SALT LAKE CITY, Utah, February 19.

The annual report of the Daly-West Mining Co. shows the production of the Park City property of this corporation in 1905 to have been $1,234,458.71; which was obtained from the sale of 1,225,731 lb. of copper; 16,772,978 lb. of lead; 1,396.85 oz. gold; 1,798,628 oz. silver and 9,026,517 lb. zinc. There were produced 16,537 dry tons of crude ore that averaged $32.74 per ton, and containing 52.66 oz. silver, 0.041 oz. gold, 19.4% lead, 1.90% copper and 9.40% zinc; 15,994 dry tons of concentrate, which averaged $39.58 per ton, containing 52.65 oz. silver, 0.040 oz. gold, 28.71% lead, 1.67% copper and 16.50% zinc; 2,017 dry tons of crude ore from the 1,400-ft. level which averaged $24.35 per ton, containing 33.87 oz. silver, 0.033 oz. gold, 25.71% lead, 1.31% copper and 12.50% zinc; 419 tons of mill crude, which averaged $28.11 per ton, containing 40.78 oz. silver, 0.033 oz. gold, 24.41% lead, 1.32% copper and 15.20% zinc.

The financial statement shows a balance on hand Dec. 31, of $411,886.15, against $284,148.71 at the beginning of the year. In addition to the receipts from ore, there was $2,800 from miscellaneous sources, making a grand total of $1,237,139.60. The disbursements, including $432,000 in dividends, aggregated $1,109,401.90.

General manager Ernest Bamberger reports that the condition of the mine is not as good as a year ago owing to the stoppage of the Ontario drain tunnel, by caves last March, which resulted in the lower levels of the mine becoming filled with water, thus preventing exploration there. It had been planned to open the mine through the extension of the drain tunnel, to the depth of 2,100 feet. The development of the upper levels is reported to have brought only fair results.——At the Cactus mine, in Beaver county, some experiments are being carried on with the Waterbury process for leaching of copper ores. Manager Lee Hanchett says that the surface is being stripped by steam shovel preparatory to mining ore, and adds that there is a covering of from 5 to 15 ft. of earth to be removed. It is expected the mill will be receiving ore from this source within thirty days.

Although nothing official has been given out to confirm it, there are growing indications that things are working toward bringing the Bingham Consolidated mines and smelter into the American Consolidated Copper Co. The fact that F. Augustus Heinze has been a heavy purchaser of the stock lately and the presence of his experts at the Dalton & Lark, in Bingham, has convinced the Salt Lake public that Heinze has tied up with Coram in some manner and that he will likely be a factor in Utah copper camps in the future. The coming of the Heinze experts has been food for much comment during the past week. It seems equally certain that examinations which have been going on in the Tintic district were directed from the same source. It has developed within the past few hours that control of the Mammoth mine has been tied up, and, while the management of the latter will not let out a word in the nature of a confirmation, there are reasons to believe that plans are well matured to gather in the Mammoth, as well as the Grand Central and Victoria. With these three mines, in addition to the Eagle and Blue Bell, adjoining, the American Consolidated would have an estate in the camp that could be depended on for many years for a supply of silicious silver-lead ores.

The Heinze experts are still at the Dalton & Lark and will probably remain there for at least a week more, when they will move on to the Commercial mine, in Upper Bingham canyon.

Manager Walter C. Orem, of the Utah Apex mine, at Bingham, will probably let a contract during the present week for the construction of the 2,000-ft. aerial tramway, which is to connect the upper workings of the mine with a station on the Copper Belt Railway. With this line finished the plan is to increase the output of the mine. Utah Apex ore is desired by the smelting concerns and there are few, if any, companies operating in the camp that can get as low treatment charge.

At the Boston Consolidated Co.'s mines, the management has several diamond drills at work prospecting the copper-bearing zone. At the same time tunnels are being extended and crosscuts run, opening up the ore bodies. Experiments at the temporary mill are progressing, but Metallurgist Bettles has announced that until his work is finished and his reports are in the hands of Managing Director Newhouse there will be nothing given to the public. It is said, however, that Mr. Bettles is still of the idea that better results are obtainable from the use of stamps than rolls in the crushing of Boston Consolidated ore.

Several new suits were filed against the smelting companies operating in the Salt Lake valley during the past week, the plaintiffs in the cases being farmers residing on, and owners of, lands, in the vicinity of the plants, who claim they have been injured by reason of fumes. This question is still one of deep concern to smelting companies, as well as to the farmers.

DENVER, February 17.

Philip Argall is making the plans for remodeling the Golden Cycle mill, formerly the Telluride mill. The Golden Cycle Mining Co. is augmenting its mining facilities to handle a larger tonnage, which will be shipped to this mill. Among other improvements a large air compressor will be installed, ore skips will be used auxiliary to cage-hoisting, and electric haulage will be applied on the surface from shaft to ore-bins and waste dump.

The Akron Mining Company, of which Senator Charles Dick of Ohio is president, owning the May-Mazeppa mines in Gunnison county, will soon re-commence active operations. On October 19, 1904, the shaft on the May claim, containing the hoisting and compressor plants, was destroyed by fire. The company will re-build and re-establish the machinery on an enlarged scale. The crosscut, which was run 4,000 ft. to the May lode, encountered a blind vein 19 ft. wide between walls. The entire width is mineralized and may be handled at a profit. The vein was cut 460 ft., vertically, from the surface and is named after its width, the '19-foot' vein. Some development has been done on it, disclosing masses of ore carrying 30% lead, 32 oz. silver and ½ oz. gold per ton. The company is outlining plans for handling a large output. The mill capacity, now 40 tons, will be greatly increased.

The successful outcome of a number of the deep tunnels of Clear Creek is giving a new impetus to mining in that county. One of the most important of these is the Two Brothers tunnel which, on January 7, cut the Specie Payment vein at 1,200 ft. on its dip below the collar of the shaft, disclosing four feet of pay ore equal in value to the rich sulphide of the upper levels. Between 300 and 600 ft. in depth the vein lost its continuity, split up into feeders and yielded comparatively little ore. Production began from the tunnel level as soon as the vein was cut.

The Gem Consolidated Mining Co. is working the Gem vein through the Newhouse tunnel at a depth of 1,500 ft. from the surface. In the upper workings the ore is a copper-iron sulphide carrying gold and silver, the greater value being in gold. At 1,500 ft. high-grade ore containing sylvanite has largely replaced the pyrite. The ore mined at this depth for the same width is said to be much richer in gold than that of the upper levels.

The Ross Mining & Milling Co., operating in the San Juan country, with main office at Silverton, has secured the Kendrick smelter at Silverton. As soon as the necessary repairs can be made, the smelter will be started on ores from the Champion, Gallie Boy and other properties controlled by the Ross company. If the operation of the smelter proves a commercial success, the plant will be enlarged to handle custom ores. The Kendrick smelter was built to matte the ore of the Henrietta mine and under the management of E. W. Walter, formerly with the American Smelting & Refining Co. in old Mexico, was both a metallurgical and financial success. The mine, on account of limited development, did not furnish the tonnage required for continuous smelting, and after running intermittently for two or three years the smelter was closed. Last fall Mr. W. L. Hoyt, formerly superintendent of the Globe smelter refinery at Denver, and for four years general manager of the Smelting & Refining Co., of Australia, near Sydney, made an examination for the Ross company. Mr. Hoyt will take charge of the smelter at once for the company. For the present the work at the smelter will be confined to making matte.

ARIZONA.

The Arizona Miners' Association will hold its first annual meeting at Bisbee on April 9.

Cochise County.

The Advance Development & Mining Co., of Bisbee, is sinking a two-compartment shaft to a depth of 200 ft. on its claims, three miles from Bisbee.——W. L. Worley is having the plans drawn for a five-stamp mill to be erected on the mine of the Mesa Rica Gold Co., at Sahuaripa, near Douglas.

Gila County.

The Old Dominion, at Globe, has three furnaces running and making a heavy output. The extension to the smelter building has been completed and all is in readiness for the fourth furnace, which has been shipped. Work is progressing on the 40-ft. extension to the flue-dust chamber. The concentrator, rated at 300 tons, has recently been treating 400 tons of ore daily. The addition to the plant now building will double its capacity. Mines in the Globe district which produced high-grade silver ore in the early days are now being tested at depth for copper values with gratifying results. Some of the old-timers will soon be more profitable when worked for copper than they were for silver.

Graham County.

The Bonito Copper Co. will erect a leacher on its property, near Safford.——The Detroit Copper Co. is constructing electric transmission lines from Morenci to various properties near Metcalf. Development work at the mines will begin as soon as the new power is turned on.

Mohave County.

Hall Bros. have placed a new hoist at the Alger-Tobey mine, in the Great West section, near Kingman, and will sink a shaft.——The German-American Mining Co., whose mines near Kingman were closed down a few weeks ago, owing to the failure of the water supply, will put in a pipe-line and power machinery to convey the water from Spears lake, nine miles distant. Steam power will re-place gasoline at the principal mines and a compressor will be put in for the operation of machine drills.——The owners of the Minnesota-Connor property, near Kingman, are preparing to resume operations and will sink a shaft from the 500-ft. level.——It is announced by the owners of the Oro Plata mine, near Kingman, that the main shaft will be sunk to the 500-ft. level, from which point drifts will be run.——Preparations are being made to sink the main shaft of the Rico mine, near Kingman, to the 200-ft. level, where crosscuts and drifts will be run.——The smelting plant at the mine of the Arizona-Mexican Mining & Smelting Co., at Stockton Hill, near Kingman, began operations on February 9.

Pima County.

The old Mammoth mine, which has been abandoned for nearly four years, will become an active producer again, according to F. Carr, of Tucson, who says that C. W. Johnson expects to re-open it. Mr. Johnson was manager of the Mammoth mine 10 years ago. When he resigned George. B. Blair was appointed in his place under the English syndicate. Mr. Johnson believes the old Mammoth still capable of producing. Mr. Carr is mining in the Tucson mountains. He says that a tunnel is being driven, over 200 ft. of it now completed.

Pinal County.

P. B. McCabe and others are building a custom smelter on the Gila river, above Florence. A lead furnace has been set up and a 50-ton copper jacket is being put in.——The Troy-Manhattan Co., at Troy, report having broken into a large body of chalcopyrite ore on the 500-ft. level at the Buckeye mine.——The Rescue Copper Co. is equipping the Ajo mine, near Florence,

with a 50-ton smelter, which it is expected to have in operation within 60 days.

Santa Cruz County.

R. E. Doan and others have ordered a 15-stamp mill for the Pearce property, four miles from Patagonia. The mill will be similar in construction to that operated by Mr. Doan on the Vanita mine.

Yavapai County.

The Gold King Mining Co. is preparing to push its tunnel, now in 420 ft., to 800 ft. on its mine in the Bradshaw mountains, near Poland. A new air compressor has been ordered.

P. A. Johns, of the Alvarado mine, at Martinez, states that it will require about 50 days to unwater the mine at the present rate. Mr. Johns has under consideration the installation of a reduction plant at the mine. ——The Rincon Mines Co. has ordered a 125-h.p. engine for its mine, near Martinez.

M. H. Ryan, superintendent of the Wisconsin-Arizona Mining Co., states that he is arranging to begin work on the company's property in the Turkey Creek district, four miles north from Poland.

R. C. Houston, lessee of the Olden mine, in the Weaver district, near Octave, is driving a drift from the 185-ft. level.

CALIFORNIA.

Amador County.

The mill and all underground work at the Oneida mine, near Jackson, have been stopped, and for the time being only exploration work will be done. A winze will be sunk to the depth of 1,000 ft. from the lowest level, in the hope of finding a better grade of rock.—— The mill at the Mitchell mine, near Jackson, has been shut down temporarily, owing to the breaking of the 6-in. cam shaft.

El Dorado County.

Collins & Bacchi have put in a new whim, car and skip at their mine, near Georgetown.——The shaft at the Rosencrans mine, near Placerville, is now down 370 ft. It is the intention to sink below the 400-ft. level and crosscut to the ledge.——The old shaft at the Mount Pleasant mine at Grizzly Flat is being unwatered preparatory to sinking 200 ft. deeper, to the 1,000-ft. level. ——At the Sherman mine, near Placerville, sinking has been resumed. It is the intention to sink to 400 ft. and then crosscut to the ledge.——W. P. Carpenter & Son have bonded their gravel mine, near Smith's Flat, to a Colorado firm to be developed under management of J. Swansborough.——Smith & Coster are to put in a four-stamp mill at their mine below Georgetown. The machinery is at Auburn and will be placed as soon as the weather will permit.——The Standard Unit mine, at Coloma, will be started up this week. Water was turned on to try the pipes a few days ago.——The New Highland Co. is making arrangements to resume work on the Mameluke Hill mine, near Georgetown.

Kern County.

The Orphan Girl mine, near Randsburg, has been sold to Chanslor & Canfield, of Bakersfield, who state that they will put in new machinery and begin working the mine.

E. B. de Golia and other new owners of the tungsten mines, near Randsburg, have arranged to ship the low-grade ore from the mines to the mill at Barstow.——The St. Elmo, near Randsburg, has re-opened with C. S. Pillor in charge.

Mono County.

R. V. Crowell has bought from J. M. Carney the Alamo mine at Little Antelope Valley, near Bridgeport. ——T. V. Whitelaw, of Masonic, near Bridgeport, has bonded the True Friend, Toughnut and Astersion claims near Masonic.

E. S. Smith, of San Francisco, has taken a bond on the Consolidated Pacific, owned by T. Colligan; the Midnight and Flagstaff, owned by T. and J. S. Cain, and the New Standard, owned by Mrs. Belmont and J. Long. The bond calls for $12,000 worth of work to be done in four months, $1,000 per month on each group. At the expiration of four months, if the sale takes place, the owners will receive about $50,000. Mr. Smith expects to commence work by February 26.

Nevada County.

W. Howard and Robert Kemp, of Grass Valley, will run a tunnel at their claims in the French Corral district, northwest of Grass Valley. They have recently taken up eight claims in that section.——The president and superintendent of the Brunswick Consolidated Gold Mining Company, near Grass Valley, recommended the re-placing of the present mill with a modern 20-stamp mill, and the installation of an electrical hoist, the latter to cost about $2,000.——The sand plant at the Central Consolidated mine has been completed, and arrangements are now being made for the installation of an electric hoist. Seven settling boxes have been added, and an addition has been made to the mill house, for use in drying and housing sulphurets when bad roads interfere with transportation.

Work has begun on the extension of the Central Shaft by the North Star Mines Co., near Grass Valley. Sinking has commenced at the 1,600-ft. level, where the vein will be followed to a depth of 3,000 ft. additional. Levels will be turned every 300 feet.

J. Ghimalli, John Gono, J. Jacum and John Jacniutti, workmen at the Delhi mine, near Columbia hill, were arrested on February 15 charged with the theft of 300 lb. of specimen ore, valued at $2,500, from the strong box at the mine. Small specimens of ore were found in the bunks of each of the men, and it is believed that the bulk of the stolen ore will be found hidden near the mine.——H. C. Cloudman reports the arrival of a drilling machine, weighing 7½ tons, at Youbet to be used in prospecting the banks of Greenhorn creek in the interests of the lessees of the J. S. Goodwin gravel property, near Youbet. In case results are favorable a dredger will be installed.——The electric hoist at the Sultana mine, near Nevada City, is being installed and sinking will be resumed. A site is now being cleared for a 40-stamp mill.

Plumas County.

J. M. McClung has purchased the Caledonia group on the South Branch of the Feather river, six miles east of Cascade Valley.

San Bernardino County.

The Needles smelter was blown in on the 10th inst. and since that time from 30 to 100 tons of ore has been reduced daily, making bullion valued at about $4,000 every 24 hours. The plant was erected by the Arizona-Mexican Mining & Smelting Co., under the management of L. D. Godshall. Mohave county mine owners now have a market for their low-grade ores, the rate to the new plant being made to allow of the shipment of ore that could not be handled under old conditions. The company has mines in Mohave county capable of supplying 25 tons of ore daily. These mines will soon be making their maximum output, as the mill is about to be erected to handle the low-grade ore from the mine and ship in the form of concentrates. The remainder of the ore will be supplied by custom ores.

D. P. Kendrick is repairing the Sloan mill, four miles from Daggett, preparatory to operating it on ore from his mine near Calico.——Samuel Slokum is arranging to open the Edna and Gold Chief mines, near Barstow.—— The Dry Lake Mining & Milling Co. has begun drifting at the 170-ft. level on the Fortuna ledge at Dry Lake, east of Victorville.

C. P. Dunn, president of the Red Hill Mining & Smelting Co., states that the company's mill, 12 miles east of Victorville, will open on March 1. At present he is trying to develop a water supply in the bed of a dry lake near the mine.

San Diego County.

Repair work at the High Peak mine at Julian, which was damaged by the recent cave, is about completed.

Siskiyou County.

Work will be resumed at the Eliza mine at Humbug, near Yreka, on March 1. A cyanide plant will be installed early in the spring.——Carter & Taylor, owners of the Empire mine on the Klamath river, near Yreka, are constructing a boom and will hereafter float fuel to their mine.——The Graham Consolidated Mining & Development Co. is preparing to instal pumps and mechanical elevators at the Garvey Bar mine at Garvey Bar, near Yreka. Water power will be used.

P. L. Young and others, operating between Virgin and the head of Eagle creek, are negotiating for an aerial tramway and preparing to put in an electric plant on the creek below their mine.——A 400-ft. tunnel is being driven on Horse Shoe Bar by Supt. Lindsey, of the Horse Shoe Bar mine, to turn the water of Trinity river from three-fourths of a mile of river bed. Machinery will be put in to pump out the holes in the bed, and two strings of 16-in. pipe will be laid to carry water from the dam to the scene of operations.——F. P. Burris is putting in a mill and bucket tramway on his property, near Burris.——The Quartz mines, on No Nothing creek, which have been idle during the winter, are now resuming work.——W. R. Dowell, superintendent of the Malloy quartz mines, on Tanner's peak, near Sawyer's Bar, is raising 140 ft. to the surface from the lower level, and is planning to instal a milling plant in the spring.—— The Fernandes Hydraulic mine, on Cherry creek, began operations last week, though the water supply is still light.——The mines near Orleans now have plenty of water and work is being resumed.——Derricks and machinery have been installed at the Ten Eyck and Hickox mines for handling boulders.——Night and day shifts are operating at the Salstrom mine, at Orleans. ——L. P. Puter, H. L. Ricks and H. S. Hinzie, of Orleans, are planning the erection of a small mill at their mine on Orleans bar.

A two-step centrifugal pump, capable of handling 500 gal. per minute, and an improved hoist will be installed at the Blue Gravel placer mine, 1½ mile from Yreka. The old equipment will be used in clearing out the mine and in keeping it clear until the new pump can be set. Steam power will be used, one 60-h.p. and one 40-h.p. boiler being employed.

The new owners of the Big Slide placer claims on the mouth of Deadwood creek, near Yreka, are putting in machinery. Centrifugal pumps will be used to raise water from the creek bed for use in hydraulicking.—— John Koob is sinking a shaft on the ledge at his claim, two miles west of Yreka.

Santa Barbara County.

A shaft has been sunk a short distance on the Coats Ranch in Santa Barbara, where a find of gold was reported last week, but further development will be delayed until plans can be completed.

Sierra County.

The drain tunnel at the Alaska mine, at Pike City, has tapped the shaft, and the mine is now drained to the level of the tunnel.

Solano County.

Another shaft is being sunk at the St. Johns quicksilver mine, five miles from Vallejo.

Trinity County.

Robert Foster, of Arcata, president of the New River, Panther & Quimby Creek Mining Co., states that the company is prepared to build a mill on its mines, near New River, in this county.——The Trinity County Hydraulic Gold Mining & Milling Co. is sluicing on its property, near Weaverville, and uncovering stringers to the main ledge. They are contemplating putting in a Huntington mill during the summer. E. P. Campbell, of Eureka, Cal., is secretary of the company.

Shasta County.

The Mammoth Copper Co. of Kennett has placed its entire force on the eight-hour schedule.

Walter G. Van Matre has an option on the Black Oak mine at French Gulch and has contracted to run a tunnel 230 ft. below tunnel H, work to be begun within 60 days.——The Balaklala Co. has plans drawn for the construction of a hotel at Balaklala, near Kennett, to accommodate 200 men. Construction work on the 1,000-ton smelter is to begin on March 9. A spur track to connect the works with the Southern Pacific tracks is being surveyed, and the pipe-line from Cottonwood creek is about completed.

Trinity County.

Frank Burris and others are putting in a new engine and other machinery at the Bear Tooth mine at New River.——J. A. Brent is in San Francisco, figuring on a Huntington mill for the Birdie M. mine, near New River.

Tuolumne County.

The Duleek Gold Mining Co. has bought the Duleek mines Nos. 1, 2, and 4, five miles northeast of Groveland, for $12,666.——Gribble & Shiels began running their *arrastre* near Tuttletown this week.——J. A. McDonald has bonded the mineral rights of the Ida Klein ranch, near Stent, and will begin devopment.——Charles Gillis has completed his new 3-stamp mill on the Chileno mine, near Sonora. It is operated by a 10-h. p. gasoline engine.

Chas. E. Connally is reported to have sold to J. D. Fleming, of Humboldt county, a two-thirds interest in the Royal, formerly the Bonanza mine, near Sonora.—— The Voinich 40-stamp mill, at Angels Camp, is completed and began operations Feb 17. The shaft at the mine is down 800 ft., and ore is being taken out on the 600, 700 and 800-ft. levels.——A large hoist is being installed at the New Albany mine, near Carter's.

COLORADO.

(Special Correspondence).—Excitement prevails here owing to the arrest of Moyer and Haywood, of the Western Federation of Miners, on Saturday, at the request of the Idaho authorities. Orchard, the party under arrest at Boise, Idaho, for the murder of ex-Governor Steunenberg, is reported to have made a confession and implicated the officials of the Federation. Requisition papers were honored by Governor McDonald of this State, and the parties arrested were taken to Idaho by special train under armed guard to prevent any attempt at rescue by friends of the accused. A man named Pettibone was also arrested and taken to Idaho with the Federation officials, as being implicated in the affair.

Denver, Feb. 19.

Clear Creek County.

The record of the Mendota mill at Silver Plume, last year, shows what may be done with the low-grade mines in that district. Stephens & McGrath, who are operating the mine and mill under lease, make the following statement of their business for the year 1905: Tons of zinc shipped, 870; tons of lead shipped, 257; tons of iron shipped, 483; total, 1,610 tons. The value per ton was: Zinc, $31.35; lead, $51.48; iron, $10.50; total gross value, $45,576.36. There was paid for freight and sampling, $3,414. The cost of mining and milling was $14,480.15, and $4,441.62 was paid as royalty, leaving a net profit for the lessees of $23,231.59. An average of 50 tons of material per day was handled, some of which was from old dumps, some from the old stopes in the mine, and the remainder was low-grade zinc and iron ore that had been left in the mine when it was worked for the lead product. Three men on a shift, working eight-hour shifts, are employed in the mill. A much better record, it is thought, will be made this year, as included in the cost of mining and mill as given above, was a great deal of dead work, getting stopes in shape for running and timbering, so that streaks of zinc could be mined, which will result in a larger output of concentrates.

Gunnison County.

The Daisy group, in Redwell basin, is to be operated another season. This property produced a large amount of silver lead ores some years back, and, it is reported, a good showing of the same ore is to be seen in the property now.

The new mill at the Maple Leaf mine is nearing completion. A large amount of ore is broken and a larger tonnage is said to be blocked out in the mine.

Lake County.

The Hattie Clark group, adjoining the Alps, in South Evans gulch, Leadville, has been leased to a Pennsylvania syndicate, which has also an option. It is the intention to sink a new shaft from the surface, which is expected to find the ore-shoot west of the fault that runs through that section of the hill.

The Silent Friend, in the same section, has resumed work and the shaft will be deepened. The ore-shoot above pitches into Little Ellen hill.——It is reported that T. Goodwin has disposed of his interest in the New Monarch group and J. B. McDonald has been appointed superintendent.

The new lessees on the little Jonny, at Leadville, who recently purchased the Harvey lease, have started to move the zinc ore and it is now going out at the rate of 50 tons daily. The average value of the zinc is 35%. Large quantities of iron are being shipped from different properties on Fryer hill, and, as none of this iron runs less than five ounces silver per ton, with an excess, the men are doing well, with silver at its present price. From the Chrysolite about 100 tons daily are being shipped by the lessees, and from the Dunkin, Matchless, Little Chief and Little Pittsburg about the same amount goes out daily.——The new mill of the Damascus Mining & Milling Co. is completed. The initial run will be made on ore from the company's property on Mosquito and after that custom ore will be handled.

La Plata County.

The Southern Pacific Railway continues to acquire coal-land in this county, having just consummated a deal for 2,000 acres lying near the Perin's Peak property, bought a few days ago by the Rio Grande.——The latest purchase by the Southern Pacific is separate from the recent purchase of the 20,000 acres from the Porter Fuel Co. A large portion of the money is said to have been paid and deeds are being recorded. The price is reported to be over $100,000, making a total of about $850,000 the Southern Pacific Co. has spent for coal-lands in this county within the past two weeks.——The Southern Pacific recently completed a survey for a line from its main line in Arizona to Hesperus and Durango, and has secured practically all the right-of-way, and the acquisition of this coal-land by the two railroads assures the development of the bituminous coal in southwestern

Colorado. Much of the coal has good coke-making qualities, and it is reported that the new owners intend to erect coke-ovens near Porter to treat 3,000 tons of coal per day.

Ouray County.

In the city limits of Ouray is the Mineral Farm group of 240 acres, in which a strike of silver-lead ore was made in the Midnight recently. This group is one of the oldest in the camp and has been worked at intervals for years, with varying success. Heretofore no attempt was made to explore at depths the lime in which the workings are located. It was the opinion of Mr. Dupraw, the superintendent, that the principal bodies of ore would be found at greater depth. Twenty feet of the shaft is in ore. The ore is in the bottom of the shaft and on all sides of a chamber 30 ft. square. The indications are that an east and west fissure vein has been struck and that it follows a porphyry dike which cuts through the lime. The chamber at the bottom of the shaft has produced 80 tons of high-grade ore, and 250 tons of mill ore, which is in the dump, where it will remain until the mill can be started next summer.

Park County.

George Sheldon, an old-time prospector and miner, has during the last three months been tracing the source from which pieces of rich copper float found in the district came, and has located the ledge and followed it for over 3,000 ft. on the surface. In four cuts made on the vein he has ore from 7 to 63%. The ledge dips at 45° and improves in width and values with depth. A number of claims have been taken up and one syndicate has 200 acres.

Teller County.

A rich shipment was made recently by Lessees Gillespie, Bruington and associates from the Old Gold estate, on the west slope of Beacon hill, being less than three tons of ore, but it is expected that the shipment will net close to $10,000. About a quarter of a ton of the rich sylvanite and quartz was alone estimated to be worth $15 to $20 a pound, gold value, and is believed to also carry high silver values. The lessees took hold about two months ago and have been mining ore almost from the start. They have opened up in virgin ground, north of the shaft, at the 400-ft. level, an ore-shoot six feet in width, carrying rich streaks of sylvanite. One of these streaks yields an almost solid seam of telluride ore, from one to nearly three inches across.

The annual report of the Portland Gold Mining Co. for 1905, and issued Feb. 5, 1906, shows that 100,986 tons of ore were produced and shipped to the company's mill at Colorado Springs, having a gross value of $2,373,600.14. In addition to this there were 8,246 tons of low-grade ore shipped from the dumps of the company's mines. This was worth $48,433.28, making a total of $2,422,033.42. The net profits from all sources for the year to Dec. 31, 1905, were $881,275.56. The manager's report shows that during the year 19,982 ft. of drifts and crosscuts were run, at a cost of $4.614 per foot. The raises, a total of 970 ft., cost $5.60 per foot, and of shafts and stations, 120½ ft., $17.526 per foot. Stoping cost for breaking 72c. per ton, 342,969 tons being broken. Timbering in stopes cost 41c. The general expense was but 21c. per ton. The total mining expense was $2.096 per ton of crude ore; of freight and treatment, $2.05 per ton; total operating cost, $4.2245 per ton, and $14.426 per ounce of fine gold produced. ——John Sharpe, operating several properties in Cripple Creek district, has again struck it rich, after having a lease about seven hours. Recently he purchased the lease of H. Richmond & Co., on the Aileen claim, located between the Mary McKinney and Chicken Hawk properties, on Guyot hill. The amount paid was $9,700. Men were put to work within a week, a rich vein being opened. The pay streak is 2½ ft. wide and returns from $200 to $250 in gold to the ton. The mineral is a dark granite, carrying sylvanite.

IDAHO.

Ada County.

Three raises have been started from the west drift of the tunnel level at the Big Giant mine, 12 miles from Boise.

Boise County.

J. T. English, of the New Century Mining Co., has bought supplies and has sent men to the company's mine at Twin Springs. W. H. Jackson, formerly foreman of the Friday mine, at Pearl, has been made foreman of the New Century.

Elmore County.

D. W. Shelter and Mr. Spranger are preparing to start up the Canton Gold Mining Co.'s dredge, on the Snake river, above Glenns Ferry.

Idaho County.

Late developments of the Buster mine, near Elk City, it is said, show the body of ore to be 200 ft. in length, 100 ft. of which has been crosscut, showing 22 ft. of solid ore. The drift has developed the ore on the foot-wall side of the vein, 100 ft. of which sampled showed $30 per ton. Fifty per cent of the values are free and the remainder is concentrating ore. The last 100 ft. drifted on the same character of quartz, but not uniformly mineralized, but assays $10 per ton. Along this vein the surface outcrop shows quartz 60 ft. in width, with the best values on the hanging-wall side.

Shoshone County.

The course of the tunnel now being driven at the Phœnix mine, near Burke, has been changed, in order to follow the course of the hanging wall. The tunnel is now in 217 ft.——The Champion Copper Co. is making arrangements to resume operations on its two claims, five miles southeast of Mullan. The main drift will be continued to a point vertically underneath the principal surface showing.

Washington County.

The Hancock Copper Mining Co. is to put in a new process reduction plant, including boiler, engine, crusher, rolls and a series of tanks at its mine near Cuprum.

R. H. Hillen, president of the Syndicate Mining, Milling & Smelter Co., has begun work on a tunnel on its claims, near Weiser, which is expected to cut a ledge at a depth of 250 ft. The company is arranging to ship ore down the Snake river.

MONTANA.

Beaverhead County.

J. J. Sullivan, of Butte, reports having a lease and bond on copper claims, near Argenta, and that some of the ore will assay 16% copper and considerable silver. In addition to the Argenta claims, he says he has an option on a group of four claims in the Blue Wing district, five miles from Bannack, and that silver ore was shipped from this property to Swansea, Wales, in 1868.

Deer Lodge County.

The Washoe Smelting Co., at Anaconda, has ordered electrical equipment aggregating 259 tons for its 10,000-ton concentrator. This includes dynamos weighing 40 tons each.

Madison County.

C. Austin, of Butte, has sold the 100-ton roller mill on the Red Bluff group, at Red Bluff, to the Minneapolis company now operating the Mammoth property at Mammoth. It was built three years ago for the Red Bluff mines, but was operated only six weeks. It is the intention to transfer it to the Mammoth. Additions will be made, including a cyanide plant.

Missoula County.

The air compressor and other machinery for the Montana-Standard mine, near Thompson, have arrived and are now being placed. The lower crosscut tunnel, which has been driven 500 ft., will be extended 900 ft. further, to the ledge.

Silver Bow County.

(Special Correspondence). — The settlement of the Heinze-Amalgamated copper war will result in the re-opening of a number of mines that have for years been closed by injunction, and an increase of the Butte copper production by several million pounds per month. The transfer of Heinze and United Copper interests to Thomas F. Cole, for the new company that is to be organized, has been completed. All the interests in Butte owned by Heinze and his associates, with the exception of the Lexington group, the Nora mining claim and interests in the mining property and real property of the Davis estate, have been transferred by deeds recorded in Butte. It is announced that in a short time counsel representing the Amalgamated and Heinze will go into court and have dismissed the 100 or more suits now pending, which involve claims for more than $50,000,000 damages. With the dismissal of the mining litigation, more than one-half of the business of the three departments of the district courts will have been disposed of, and fully a third of the litigation that has been occupying the attention of the Supreme Court.

Drifting is being done on the vein opened on the 2,200 ft. level of the Anaconda mine and the ore throughout the workings is as rich as that at the point where the vein was cut. The vein is 50 ft. wide and a big portion of it is copper glance. Good progress is being made on the crosscut on the 2,400 level, and it is expected that the vein will be cut at that depth in about three weeks. A vein 4 ft. wide, containing 2½ ft. of copper glance, was found while driving the crosscut, but no development has been done on it. It is surmised that the vein is an enlargement of a stringer that was mined on the 2,200 level.

J. Parke Channing has been in Butte for a week representing the Lewisohns of New York, who are interested in a lease and bond on the Amazon group, southeast of the city, and lying just south of the Pittsburg & Montana Company's mines. Three or four of the mines have been slightly developed and good copper ore has been taken from some of them, but the ore was found in pockets and not in continuous bodies. Mr. Channing has placed machinery on the Altoona, one of the group, and will examine the old workings. After that he will have the Amazon shaft cleaned out and make an examination of that mine. If his report is favorable, the options will probably be taken up by the Lewisohns. It is the intention to sink a new shaft at a more accessible point and develop the claims from that shaft.

The Butte & St. Louis Mining Co. has been organized by Butte and St. Louis men for the purpose of developing the Kessler mine, an old silver and gold property, lying northwest about 1,000 ft. from the Alice mines. Years ago the Kessler produced a great deal of gold and silver and it has some good copper indications. The company is capitalized for $600,000.

Still another new company recently organized is the Butte & Bacorn, which filed articles of incorporation in Augusta, Me., a week ago. It is capitalized for $5,000,000 and its purpose is to explore a lot of new ground far northeast of any developed mines of the Butte district. Its ground comprises about a dozen recent locations along an outcrop.

The Butte & London Copper Mining Co. is making good progress in sinking a shaft on the Greendale claim. It has reached a depth of 60 ft. and some fine ore has been cut. No water has been encountered and all the usual difficulties and hindrances have so far been absent.

Through the efforts of some Butte men to 'boost' Anaconda stock, a false report was sent out from Butte about a week ago to the effect that the big vein for which the company is now working on the 2400 level had been cut. The report pretended to give exact measurements and values of ore in different parts of the vein.

Butte, Feb. 19.

NEVADA.

Elko County.

G. Knutzen has been developing the Old Bullion, 28 miles south of Elko. Mr. Knutzen says that he feels justified in starting in on an extensive scale. Development work exposed orebodies of value.——The Edgemont mill at Edgemont, which was seriously damaged by a snowslide a few weeks ago, has been repaired and is again working to its full capacity.——C. H. Spooner is figuring on erecting a mill at the Dexter mine, near Tuscarora, for H. H. Mayham of Denver and his associates.

Esmeralda County.

M. J. O'Meara and T. J. Lynch are buying equipment for the mine of the Silver Peak-Valcalda Gold Mining Co. at Silver Peak. The equipment will include a ten-stamp mill, pumping plant and piping for a four-mile pipe-line. Water is now being developed three miles from the mine. This will be lifted 800 ft. in order to secure a gravity flow to the works. It is hoped to have both mill and pumping plant completed early in May.——The Goldfield Tule Canyon Mining Co. is now down 70 ft. on the Ingols mine at Tule Canyon, near Goldfield, and has arranged to continue sinking.

Lincoln County.

(Special Correspondence).—The new 10-stamp mill of the Searchlight Mining Co., at Searchlight, is completed. The mine is 300 ft. deep. The mine makes about 75,000 gallons of water daily, which will be used in milling. The pumping is done by compressed air, the compressors and all other machinery being operated by gas-engines. The camp is 30 miles from Nippon, on the railway. —— The Quartette mine, 18 miles west of Searchlight, is 900 ft. deep. It is equipped with a large hoist. The mine water is used here also in the mill, the tailings being settled and the water pumped back for re-use. —— The Cyrus Noble mine, at Searchlight, has completed its 10-stamp mill. This mill is of unusual type in California. It came from Georgia. The boss-heads are fully 30 in. long, the stampheads are 7 in. diameter, and the stems 3¾ in., the whole weighing about 800 lb. They drop 80 times per minute.

Searchlight, Feb. 19.

Nye County.

The Lucky T. Mining Co. is driving a tunnel to intersect two ledges on its mine at Orrville, forty miles south of Bullfrog.

The Tonopah-Wall Street Mining Co. announces that negotiations are pending for the purchase of a steam hoist, preparatory to sinking a main shaft to the lode porphyry, from which crosscuts will be run. The estimated depth of the shaft is 540 feet.

Storey County.

A cave recently occurred at the collar of the Ophir shaft, carrying out several sets of timbers. Since then the gallows frame has been secured, the cave cleaned up and timbers re-placed.——The Ward shaft at Gold Hill is now open and in good condition to 2,369 ft., this having mostly been accomplished since the summer of 1904. ——The tail-rope system of winding has been installed at the Union shaft.

Washoe County.

Mr. Clapp, manager of the Willow Creek Mining Co., states that the company will put in a 200-ton mill and concentrating plant on its property in the Washoe district, 12½ miles from Reno.——A rich strike is reported as having been made in the Desert King mine, where ore assaying a hundred dollars per ton was uncovered by Mr. Ramsey, the leaser. Two weeks ago a strike was made on this property, but this latest find was made by a single shot. Governor Sparks and his associates four years ago took charge of the Wedekind property. Soon afterward the vein pinched. Instead of abandoning the property, Governor Sparks erected reduction works and began developing. The work continued until the find just made.

White Pine County.

The owners of the Uncle Sam group at Bald mountain have contracted with Fred Blank to construct a dam 160 ft. long and 12 ft. high to conserve water for placer mining in Water Canyon. They have also placed orders for ore cars and track for use at the quartz mines. Elko, Elko county, will be the shipping and supply point for the mines.

NEW MEXICO.

Colfax County.

Work has been resumed on the Lynch mines at Elizabethtown, after an idleness of several years. C. J. Gibson and J. Murphy, of Philadelphia, have an option on the property. A. P. Hunter, of Wallace, Idaho, will be manager, and M. Cawley superintendent. The property is also known as the Red Bandana group. Over 2,000 ft. of development work has been done. A five-foot Huntington mill, engines, boilers and shaft-house are on the property. The formation consists of granite and metamorphic rocks. Near the surface the ore is free milling, but changes to sulphide at depth. The Huntington mill is to be re-placed with a 50-stamp mill, as it is believed by that method the free-milling ore can be treated at a cost of $4 per ton. The new owners paid $165,000 for the property.

Santa Fe County.

The owners of the Keystone mine at Cerillos, are retimbering the shaft and preparing to put in new machinery, a portion of which has arrived.

OREGON.

Coos County.

T. C. Archer states that he will build a 100-ton smelting plant, to cost $50,000, on Coos Bay, near North Bend.

Curry County.

E. H. Russell, of the Gold Bar Mining Co., of Illahe, says that the company will operate two giants on its placer ground this spring. About 3,200 ft. of pipe-line is being laid to carry water from the penstock to the mine. Electric power and light will be supplied to the property.

Baker County.

The management of the Tabor Fraction, at Bourne, reports having purchased an 80-h. p. motor for the hoist and a 50-h. p. motor for the mill. A hoist and an aerial tramway will be contracted for in a few days. Improved machinery for the mill will be purchased by Mr. Case in Denver.——One 6 by 16 in. rock crusher, one

4 by 12 in. rock crusher, several small pumps, piping and parts have arrived at the Imperial mine, near Sumpter. The larger breaker will crush the ores from the grizzlies to an inch size and the smaller one will crush the oversize from the trommel screens to ¾-in. size. The new boilers were put in place the past week.

Crook County.

E. Gatewood, of Prineville, representing the new owners of the Mayflower mine, near that place, is arranging to instal a five-stamp mill and a cyanide plant.

Josephine County.

Robert O. Towns, the new owner of the Blue Ledge mine, 40 miles from Grants Pass, states that extensive additions will be made to the plant and that the mine will be worked on a larger scale.

Jackson County.

The Homestake Enterprise Mining Co., of Woodville, has completed its connections with the Condor Water & Power Co. and is now operating a five-stamp mill by electricity.

Grant County.

Manager N. Berkeley, of the Buffalo-Monitor mine, at Granite, has let contracts for extending the lower crosscut tunnel to the Buffalo ledge and for extending the north drift on the Buffalo vein.

SOUTH DAKOTA.

Lawrence County.

Mine Inspector N. Treweek, of South Dakota, has issued his official report for 1905. It shows that the mines of the Hills are in good shape and well provided with safety appliances. The tonnage output of the mines for the year was 2,080,271, of which the Homestake handled 1,534,400 tons. The men employed in the mining industry was 3,549, of which number 2,800 are in the employ of the Homestake company. The total bullion value for the year was $7,191,533.71, of which the Homestake produced over $5,000,000. The production of the different companies was:

Alexander Maitland	$ 320 00 00
Clinton	10 704 74
Dakota	120,337 69
Gilt Edge-Maid	110,665 00
Golden Reward	391,350 69
Hidden Fortune	80,724 24
Homestake	5,080,000 00
Horseshoe	379,182 00
Imperial	251,000 00
Lundberg, Dorr & Wilson Cyanide	184,400 00
Portland	8,905 59
Spearfish	157,918 80
Wasp No. 2	86,324 96
Placer mining (estimated)	10,000 00
Total	$7,191,533 71

Majors, Dunlay, White & Fish, who have a lease on the Faust ground and the adjoining claims of W. L. McLaughlin on Blacktail gulch, near Deadwood, are running the Columbus mill on ore taken from that ground, crushing 40 tons of ore—the first that has been treated in the mill since it closed down several months ago. The ore is coming from a large, vertical vein, beneath the cement in the Faust ground. Hitherto the ore mined in this ground has been taken from above the slates, and is conglomerate.

UTAH.

During the year just closed various Utah properties produced 6,580,000 lb. of zinc, which represents a valuation of $383,282.40. Beside the Horn Silver mine, the State has several other zinc producers of importance, notably the Scranton, which soon will be shipping 50 tons of zinc-lead ore per day, and the Daly-Judge.

Piute County.

The new power plant of the Sevier Consolidated Co., near Junction, was started up on February 13. One hundred tons of ore per day are being treated.

Summit County.

The annual report of the Daly-Judge mine, near Park City, is of interest. It contains the following: "After a period of 23 months of development, from February 1, 1904, to December 31, 1905, it was decided to resume production of ore. All the work has been done on the 1,300, 1,400 and 1,500-ft. levels, amounting in all to 10,168 ft., which, with the exception of 130 ft. of upraises and a 70-ft. winze, consisted of driving levels and crosscuts. In doing this work many shoots of ore have been passed through, some of which give promise of developing into large orebodies when stoping is commenced on them, and a good part of the ore should be of shipping grade. On the 1,300-ft. level bodies of ore have been driven through, carrying values in lead, silver and zinc. These shoots are of sufficient strength to insure a good tonnage of ore. The 1,400-ft. level has been extended 1,600 ft. southwesterly into new territory, and it is on this level that most of the ore has been found, the character and value of which is much better than that developed in the old workings. Drifting is progressing on the 1,500-ft. level on the same vein as that in which the ore-shoots were encountered on the 1,400-ft. level, and has already passed through some orebodies of a good grade. There seems no doubt that this level will duplicate conditions as they exist on the 1,400-ft. level above, and which will make over 100 ft. of stoping ground. In the prosecution of this prospecting work a great amount of ore has been taken out and stored in the ore-bins and on dumps on a level with the concentrating mill, in all about 20,000 tons. This dump will serve as a basis of ore supply to the mill, thereby assuring a steady run at all times, as its operation will not be dependent upon the mine turning out a sufficient tonnage each day, if, for any unforeseen reason, it did not do so. We are now shipping from 35 to 40 tons of zinc middlings per day, ranging from $5 to $8 per ton. We have of this product an estimated tonnage of from 12,000 to 15,000 tons in the old dumps, while the mill will continue to make this class of product."

Forty men are now employed at the Ontario and conditions are said to be encouraging. A large volume of water rushed from the Ontario drain tunnel one day recently, the result of the removal of a mass of dirt and debris behind which it was banked. The men left the tunnel hurriedly, not knowing the extent of the flood, but returned to work when the flow had subsided. Work is going on as rapidly as conditions will permit and every precaution for safety is being taken. As the debris is being taken out the flow of water increases steadily, and it is thought that the water will drain completely away without another such violent rush as occurred there some time ago.

Sidney M. Bamberger of the Little Bell and Silver King Consolidated Mining Co. says that the new ore bins at the Little Bell mine are completed, and the accumulations of broken ore underground are now being moved out. At the King Consolidated mine the shaft has been sunk 50 ft. through a mineralized fissure and is now being continued to connect with the underlying quartzite.

Tooele County.

Superintendent Raddatz, of the Honerine, at Stockton, states that the connection of the shaft and drain tunnel has been made, but there are numerous preparatory devices which must be installed at the point of connection before the active hoisting of ore can begin.

Manager E. J. Raddatz, of the Honerine mine, at Stockton, states that the winze from the upper workings will connect with the tunnel level this week, after which the mill at the mouth of the tunnel will be put into commission.

WASHINGTON.

Chelan County.

The Red Mountain Gold & Copper Reduction Co. has taken an option on 32 claims in the Red Mountain district, near Leavenworth, and will begin development work as soon as the snow disappears. The Scandinavian-American Bank of Seattle is Washington agent for the company.

Ferry County.

The Quilp mine, at Republic, is now being opened and the machinery is being repaired preparatory to the resumption of active operations.——The Mountain Lion mine has resumed.

Okanogan County.

The Mineral Hill mine, at Conconully, has partially closed down, owing to the unsafe condition of the boiler.

Pierce County.

The Tacoma smelter has issued a statement showing that the value of all shipments received by water during January was $523,726.48. Of this amount, $514,388.96 was ore, $3,894.21 was lime rock, and $5,443.31 was general merchandise. The exports of furnace products by water for the month amounted to $441,210.42.

Snohomish County.

The owners of the Copper Bell mine at Roby have finished a chute from the concentrator to the bottom of the hill, a distance of 1,600 feet. Concentrates sent down this chute are loaded in tram-cars and hauled to the railroad.

The present winter at Darrington has seen more than the usual amount of development work in progress. Neiderprum & Bergeson have been at work on the Molly property, on Jumbo mountain, owned by L. O. Stubb, Knutson Bros., S. Bergeson and K. Neste. They are in 285 ft. and have struck a body of copper ore.——Ole Neste is doing assessment work on the Queen Anne mine.——It is reported that the Forest mine was sold in December to the Century Mining Co., which controls the Chickamun group. It is said that this company intends to erect reduction works at Darrington.

J. Dawson and J. T. Mellette have returned to the Trout Lake mine, near Index, with a crew of eight men to resume development. The tunnel is in 70 ft. on the ledge and will be driven 200 ft. before crosscutting. The party went in from Foss river on snowshoes.

Whatcom County.

Eighty-six miners, of the Mount Baker district, have associated themselves with the intention of building a smelter at or near Bellingham.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District.

H. H. Shallenberger has men opening a ledge of copper ore at the Moreen mine. For 150 ft. the trench shows good copper-gold ore. The cut is being made through decomposed rock, and no blasting is necessary.——Recently in drifting at the 350-ft. level of the Brooklyn mine, the ore-shoot, lost by a former management, has been re-discovered.——The Granby Company has taken a working bond on the Pathfinder group, up the North Fork of Kettle river. Men have been sent to the property to begin operations.——Acting on behalf of New York capitalists, George McLeod, has concluded negotiations for the group of claims consisting of the Ophir, the Gloucester, the G. H. and the G. H. Fraction, situated between Gloucester and Franklin creeks, 45 miles up the North Fork of the Kettle river.

The six smaller furnaces of the Granby Consolidated Co.'s plant at Grand Forks are to be enlarged, increasing the capacity to 2,700 tons daily.——A rock crusher with a maximum rated capacity of 3,000 tons per day has arrived at Phœnix for the Granby mines, to replace the one destroyed last December. A 250-h.p. electric hoist will be installed at the mine. —— At the Gold Drop mine, near Phœnix, new ore bins, a 600-ft. tramway and a track connecting the mine with the Canadian Pacific Railway have been put in.——Knight & Stone, of the Spokane Diamond Drill Contracting Co. have begun work on a contract to bore 1,000 ft. of holes on the Betts and Hesperus claims near Phœnix.

East Kootenay District.

The machinery for the Black-MacKay Mining Co. has been ordered. It consists of a seven-drill compressor, 100-h.p. boilers, two pumps, a hoist and two drilling machines.——Michael Sullivan is making a shipment of two or three carloads of ore from the Aurora mine, on the west side of Moyie lake. The ore will be shipped to either the Nelson or Trail smelters. It is being hauled from the mine on the ice at Aldridge to be loaded.

Lardeau District.

There is talk among the owners of the Broadview of stocking it and controlling it locally.——A vein of free-gold quartz five feet in width shooting off from the main lead has been discovered in the west drift on the Del Rey, and is now being opened up. The vein is running parallel with the formation and merges into the main lead 20 ft. from the crosscut tunnel.——Operations at the Eva mine and mill resulted in a clean-up of $5,000 in gold and concentrates of an estimated amount of $500. This is the largest amount that has been derived from a month's operations for some time.——The lead on the Silver Dollar is being drifted on at both sides of the crosscut tunnel, 250 ft. from its portal, and the south drift is in 50 ft., while the north drift is 40 ft. in length. The drifts are being run along the hanging wall, and in the south drift a solid body of steel galena has been encountered.

Vancouver Island.

The smelter of the Tyee Copper Co. during January ran 12 days and treated 2,052 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $31,022.

ONTARIO.

The plan to electrically equip the first 120 miles of the Temiskaming & Northern Ontario Railway also contemplates the sale of electrical energy to companies along the line of road, as the power developed will greatly exceed that necessary for the line mentioned, sufficient, it is believed, to provide not only for extension in the future, but for the supply of light, power and heat to municipalities and industries along the railway. This surplus energy, it is proposed to sell to distributing companies at various points, so that the railway commission will not have the keeping of accounts and the other work entailed in selling to private consumers. The rates, however, would be fixed by the commission, thus preventing the holding up of the industries, individuals or municipalities buying from the distributing companies. A number of companies and individuals engaged in mining at Cobalt have already made application for the purchase of electrical power, should the Government authorize the railway commission to proceed with the project. The power to be used would be developed from the Montreal river.

MEXICO.

Chihuahua.

J. A. Creel, F. Fletcher and D. Goodale have blown in their copper smelter at Terrazas station——H. T. R. Cowell, manager of the Barranca de Cobre mine near Chihuahua, has placed an order for machinery.——Las Vigas Mining Company has decided to double the capacity of the concentrating plant at Las Vigas mine, near Coyame.——J. J. Watterson, of Chihuahua, is arranging to put in a concentrating plant at the San Martin mine at Uruachic. A contract for machinery has been placed.

Coahuila.

The Continental Copper Mining Co. has purchased two locomotives, a cog-wheel engine, and rails for a 75 km. narrow-gauge railroad for its mine at Panuco.

Durango.

The Mexican Central Railroad, it is said, will construct a branch line from Jimulco, Durango, on its main line, to the mining and smelting camp at Velardena, the chief enterprise of which is the new 1,000-ton smelter of the American Smelting & Refining Co. Engineers have been surveying the proposed route. If built, it is supposed that a train service would be inaugurated over it between Torreon and Velardena. Communication between these two points is now over the main line of the Mexican International Railroad from its station at Pedricena.

Jalisco.

Walter R. Hazel, formerly of Guadalajara, has been made superintendent of the Bolanos mines, near Jalisco, and he will instal a hydro-electric plant on the Bolanos river to furnish power for operating the pumps.——The Mexico Union Mining Co. has installed a Dodge crusher, Huntington mill and concentrating tables, on the Soquite Prieto mine, five miles south of Ayutla, and work will be resumed at the mine at once.——Manager J. O. Hestwood, of the Atreveda Mining & Development Co.'s mine, at Atreveda, near Jalisco, states that plans are perfected for the installation of a new mill and additional cyanide machinery at the mine, and that the machinery will be shipped within the next few weeks. He expects to have the machinery in place within 90 days. Improved hoisting and pumping outfits for deep-level mining will also be installed. Shaft No. 2 will be continued several hundred feet below the 200-ft. level.

Mexico.

The officials of the United States & Mexico Mining Co., of Mexico City, have ordered tools, supplies and ore sacks for their mine at Zacualpan.

A. Velas, of La Mula ranch in the eastern part of Chihuahua, has denounced 20 pertenencias below the town of Ojinaga, for quicksilver. The location is 15 miles northeast of San Carlos, and is said to be only 12 miles from the Mariposa quicksilver mine in Terlingua district in Texas.

It is believed that the Terlingua quicksilver belt extends across the Rio Grande river into Chihuahua, but nothing has been done to develop any of the properties in this State, although a number of locations have been made.

Sonora.

J. T. Jackson, of Philadelphia, has been granted a concession to exploit the Quitovac placer mines in the Altar district, 161 miles from Santa Ana station, on the Sonora railroad.

The Sierra de Cobre Mining Co. is installing a large pump at its mine near Cananea, and will resume sinking on the main shaft.

Personal.

THOMAS BARBOUR is in New York.

J. H. MACKENZIE has returned from Seattle.

F. F. THOMAS is investigating mines in Arizona.

C. C. GATES, of Denver, Colo., is in San Francisco.

ERNEST A. WILTSEE has been visiting Mexico City.

GEORGE W. PEIRCE is at Battle Mountain, Nevada.

JAMES PENALUNA has returned from Italy to Cornwall.

FRANK H. TEATS has returned to Denver from Dutch Guiana.

W. E. THORNE has returned to Denver from San Francisco.

GEORGE W. BRYANT, of Guanajuato, is visiting New York.

WALTER M. BRODIE is examining mines at Guanajuato, Mexico.

WILLIAM N. CUMMINGS is examining mines at Silver Peak, Nevada.

J. PARKE CHANNING has been visiting the Lewisohn properties at Butte.

GEORGE D. BLOOD has returned from Nicaragua and is at Salt Lake City.

H. L. HOLLIS, of Chicago, is visiting Guanajuato with a party of clients.

THEODORE J. HOOVER has headquarters now at Aguascalientes, Mexico.

ARTHUR O. CAUTLEY, representing Bewick, Moreing & Co., is at Guanajuato.

EDWIN C. HOLDEN, of New York, is examining mines in New Mexico and Colorado.

JOHN WATT leaves for New Zealand next week to investigate dredging methods.

FORBES RICKARD is visiting Pittsburg, from which place he will proceed to Arizona.

ARTHUR L. WALKER has returned from Seattle and Salt Lake City to San Francisco.

W. H. STORMS has become an assistant editor of the MINING AND SCIENTIFIC PRESS.

JOHN JACOBS has resigned the management of the Velardeña smelter, in Durango, Mexico.

R. M. ATWATER, of Helena, Mont., is examining the Sunnyside mine, at Silverton, Colorado.

C. E. BUNKER is superintendent of the Yaeger Canyon Copper Co., near Prescott, Arizona.

W. H. SHOCKLEY, on his return from Russia, has taken up residence at Tonopah, Nevada.

STEPHEN H. LETT has left London to take charge of exploratory work in Portuguese East Africa.

WARNER MCCANN, with the Hacienda de San Francisco, at Pachuca, Mexico, is in San Francisco.

A. H. ACKERMAN has accepted an appointment with the British South Africa Company, at Bulawayo.

J. B. MCDONALD has been appointed superintendent of the New Monarch group, at Leadville, Colorado.

DAVID T. DAY, of the United States Geological Survey, was a visitor in San Francisco during the week.

F. L. BOSQUI has gone from Chihuahua, Mexico, to Goldfield, Nevada, and will return to San Francisco this week.

J. H. HINDRY, manager of the Esperanza mine at El Oro, is also to have charge of the Velardeña smelter, in Mexico.

GEORGE H. ROBINSON is visiting the Britannia mine, Howe Sound, Vancouver island, whence he will go to New York.

F. R. BURNHAM, who earned fame as a scout during the Boer war in South Africa, is engaged in mining in Sonora, Mexico.

T. PENROSE is in charge of the Yampa mine at Bingham Canyon, Utah, during the illness of Superintendent NICK TRELOAR.

THEODORE E. SCHWARZ has been appointed consulting engineer for the Iron-Silver Mining Co., of Leadville and New York.

E. H. DAVISON has returned to San Francisco from Amalie district, Kern county, Cal., and reports considerable activity there.

M. J. LIDSTONE has returned to San Francisco from Searchlight, Nevada, where he built a mill for the Searchlight Mining Company.

GODFREY DOVETON, of Doveton & Purington, has left Denver for Telluride, where he will be professionally engaged at the Liberty Bell mill.

JOHN B. FARISH, consulting engineer and general manager of The Mines Finance Co., of 40 Wall street, New York, has been re-engaged as consulting engineer for the Dolores Mines Co., of Chihuahua, and the Creston-Colorada Co., of Sonora. GEORGE J. MCCARTY, who has been manager of the latter property for a number of years, is identified with MR. FARISH in the above enterprises, and will hereafter make his headquarters in New York.

Obituary.

DAVID MCCOOK, an old-time mine owner, died at Yreka, Siskiyou county, Cal., one day last week.

Latest Market Reports.

SAN FRANCISCO, February 21, 1906.

ANGLO-AMERICAN SHARES.

London, February 22, 1906.

	£	s	d		£	s	d
Camp Bird	1	8	3	Oroville Dredging	1	1	3
El Oro	1	5	7½	Stratton's Independence	0	7	6
Esperanza	4	3	9	Tomboy	1	6	3
Dolores	2	0	0				

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. February 21, 1906.)

Amalgamated	$109⅞	North Butte	$ 85¼
Anaconda	278¼	Old Dominion	46½
Bingham Copper	43¾	Shannon	6
Calumet & Hecla	705	Tonopah-Nevada	18¾
Daly West	15	United Copper	70¼
Granby	9¼	United States	63¼
Greene Consolidated	27¼	Utah Copper	31½
Nevada Con. Copper	14		

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 35	Ophir	$5 62½
Hale & Norcross	1 00	Potosi	0 11
Mexican	1 20	Savage	0 46
Exchequer	0 53	Yellow Jacket	0 10

[Tonopah and Goldfield.]

Belmont	$4 75	Montana-Tonopah	$2 95
Golden Anchor	1 47½	Ohio-Tonopah	0 57
Jim Butler	1 27½	Red Top	1 85
Jumbo	1 50	Sandstorm	1 40
Kendall	0 84	Tonopah Ex	10 50
Midway	2 10	West End	2 70

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 66½c. per fine ounce; San Francisco, 66½c.; London, 30½d. (standard ounce, 925 fine); Mexican dollars, 52@54c., San Francisco; 51½c., New York.

COPPER.—New York (by wire, average for week ending Feb. 23), Lake, $18@18.25.; Electrolytic, 17.75@18.00c.; Casting, 17.50@17.62c. per pound. Mill copper plates, $21.00; bars, 21@24c. London: £78 spot per ton.

The total visible supply of copper in the world on February 1 was 10,951 tons, being nearly 5,000 tons less than Feb. 1, 1905, and 2,032 tons less than Jan. 2, 1906.

LEAD.—New York (by wire, average for week ending Feb. 23), $5.35 per 100 lb; San Francisco, pig, 5.70@6.60c. per lb.; pipe 8@8½c.; sheet, 9@9½c.; London: £15 15s. ℔ long ton.

SPELTER.—New York (by wire, average for week ending Feb. 23), $6.05@6.10 ℔ 100 lb.; London, £25 17s. 6d. ℔ ton; San Francisco, ton lots, 7c.; 100-lb lots, 7¾c.

TIN.—New York, pig, $36.20@36.40; bar tin, ℔ lb., 42½c.; pig, 39c. London, £166.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, nominal, $20@25 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$41.50, large lots; London, £7 7s 6d.; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 33@37c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.50; gray forge, $17.25; San Francisco, bar, 3½c. ℔ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00 open hearth billets, $27.50; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8½c.; less than 500 lb., per lb., 8¾c.; in 25-lb. tin pails, ½c. ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ½c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8½c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 14c@15c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9¼c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8½c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11¾c; 14 oz., 10@10½c; 12 oz., 9½@9¾c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3¼c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6½@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B. 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg

Books Received.

Mineral Statistics of Chile for 1903, under the auspices of the National Mining Society, and sanction of the Governor Sir William Yunge. It is an exposition of the mineral industry in Chile during the year 1903, and contains several maps. The publication is wholly in Spanish.

Clifton Folio, No. 129, of the Geologic Atlas of the United States, has been issued by the United States Geological Survey. It came up to the standard of these publications, and will be of great interest and value to those interested in copper deposits of Clifton and incidentally elsewhere.

"Report of the State Inspector of Mines for Idaho in 1905." This annual volume is somewhat of an improvement on the previous interesting annual official contributions of Robert N. Bell, State Mine Inspector. The mineral industry of the State is reviewed by counties, and is well illustrated by numerous half-tones and line drawings. It shows the industry in Idaho to be in a satisfactory condition and extending yearly. The publication of this report thus early in 1906 is commendable, and might be emulated by some others in charge of similar work.

Perhaps more has been written about cement during the past two years than about any other one material. The latest addition to the shelf of cement books is 'Practical Cement Testing,' by W. P. Taylor. The most praiseworthy, because unusual, feature of the text is that the author sticks to his subject and does not get side-tracked on other branches. It is essentially devoted to a discussion and description of the methods of cement testing. The daily routine work of the testing laboratory is detailed for the guidance of the practicing engineer and builder. After a preliminary discussion on shipping and sampling, the author discusses in detail the usual physical tests, such as specific gravity, fineness, time of setting, tensile strength and soundness. These are followed by the methods of chemical analyses and chapters on special tests. In each case, after defining the test and its object, and reviewing the conditions likely to affect it, the author details each of the manipulative steps, including full instructions as to the use and abuse of apparatus. The interpretation of results is minutely explained. The cement-testing laboratory is discussed in equipment, organization and operation. The book is concluded with examples of cement specifications. This section combines both the abstract and the concrete, being an excellent abstract of the fundamentals of concrete specifications. It should do much to insure the life and strength of our homes and factories in the future. It is published by the Myron C. Clark Publishing Co., 13-21 Park Row, New York City, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $3.

Commercial Paragraphs.

EDGAR INGRAHAM, who has recently returned from South Africa, is now with Harron, Rickard & McCone of San Francisco.

THE C. O. Bartlett & Snow Co., of Cleveland, Ohio, report the following sales: Mining machinery to D. H. Norris, Zacatecas, Mex.; plaster plant to Mahoning Builders' Supply Co., Youngstown, O.; coal-handling machinery to Monongahela R. Con. Coal & Coke Co., Pittsburg, Pa.; mining machinery to Montana Zinc Co., Butte, Mont.; special conveyor and elevator to Barnesville Glass Co., Barnesville, O.; conveying and elevating machinery to Greenville Silica Sand & Quarry Co., Greenville, Pa.

The Shattuck-Arizona Mining Co. of Bisbee, Arizona, has closed a contract with the Allis-Chalmers Co. for a double-drum duplex direct-acting Corliss hoisting engine. The steam end of this hoist will consist of two Corliss engines of the heavy duty type, having cylinders 20 in.x48 in., the engine being designed to withstand the excessive strains incident to hoisting work. The hoist will operate at 125 lb. steam pressure, and will handle continuously a total unbalanced load of 15,000 lb. at a hoisting speed of 2,000 ft. per minute. The engine is so designed that the steam pressure may be later raised to 150 lb., and is proportioned to handle the increased load which this pressure will make possible from the depth and at the speed above mentioned. There will be two drums 7 ft. in diameter having turned grooves, each holding 1,500 ft. of 1⅛ in. rope. These drums will be loose on the drum-shaft and served by powerful friction clutches. The hoist will be entirely steam-operated, and, in fact, embodies all the latest hoisting ideas in modern hoisting practice. Local conditions in this district surrounding previous installations of this size and character have precluded the use of drums, all the larger hoists being of the reel type. Consequently the operation of this hoist will be watched with interest by the mining men in Bisbee and adjacent camps.

Dividends.

To-day the Bunker Hill & Sullivan Mining & Concentrating Co. declared dividend No. 102 of $180,000, payable on March 3. This makes the total paid since January 1, 1906, $540,000, and total to date $6,066,000.

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SAN FRANCISCO, MARCH 3, 1906.

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EDITORIAL.

THE alumni of the Massachusetts Institute of Technology have collected a fund of $411,000 for current expenses of the Institute during the next five years. Eleven hundred men subscribed. This is the sort of spirit that makes a great college; the Massachusetts Institute of Technology deserves to prosper, not only in money, but in the reputation that money does not buy. There is an effective contrast between this instance of a technical institution financed by the many gifts of its own past students, and that of other places supported by the lavish donations of successful sandbaggers. Money itself may not be tainted, even when accumulated by dishonorable methods, but sentiment assuredly is more delicate; the enthusiasm of a graduate for his own place is worth more than the patronage of a pirate or the benevolence of a buccaneer.

IN a recent issue, referring to the Butte vendetta, we expressed pleasure at the cessation of litigation by the consolidation of warring interests, and we referred to Mr. Heinze's peculiar tactics as having followed in the wake of the earlier methods of Marcus Daly. This has been interpreted, by some of our friends, as meaning that Daly stole his neighbor's ore, which was not meant. We did mean to say that the lack of honor and disreputable practices that have disgraced Montana during the last ten years were not all of Mr. Heinze's doing, but that they grew naturally out of the low standards established at an earlier date.

MORTARS built to allow multiple discharge have been tried at many localities where stamp-milling is practiced. The article by Mr. Algernon Del Mar will be found to give a straightforward account of experiments made with batteries of this type. The author proves conclusively that the increased capacity to be secured by the use of multiple-discharge mortars is won at the expense of good extraction, for the gold is not allowed to remain in the battery long enough to be arrested by the mercury. It is for this reason that the steam-stamp, in vogue throughout the copper mines of Lake Superior, was a failure when imported into South Dakota. All those who take an intelligent interest in the process of the stamp-mill, know, or ought to know, that as a metallurgical device the stamp-mill is valuable chiefly because it combines in one operation the crushing of the ore and the extraction of the gold; neither as a machine for pulverizing quartz nor as a device for amalgamating gold is the stamp-mill all that it should be. When the stamps are used with the intention of crushing ore rapidly and uniformly, they are better replaced by rolls, Huntington and Chilean mills, etc.; so also when the mortar is devoted chiefly to the saving of gold, it will be found to be a crude extractor of the metal as compared to cyanidation or chlorination. The best results—that is, the largest profit per ton—can be obtained with the stamp-mill when it is applied to a simple gold-bearing quartz ore in such a manner that the rapidity of crushing is not sacrificed to, nor hindered by, the completeness of extraction. This economic ratio between the two factors requires the good sense of an experienced millman.

John Stanton.

It is a melancholy pleasure to pay the tribute of honor to a good man who dies in ripe old age after a career of exceptional usefulness. Sad enough it is to know that John Stanton has left the ranks of those that make industry noble, but stimulating to useful endeavor is the recollection of his cheery presence, kindly way and irreproachable integrity. He was born in 1830 at Bristol, England, and died on February 23, so that he had passed the allotted three score years and ten. From active work as engineer at his father's iron mines in Pennsylvania, he went to the copper regions of Tennessee, and when these were confiscated by the Confederate government, during the Civil War, he went first to Colorado, where he was associated with A. N. Rogers in the management of the old Gregory-Bobtail mines at Central City, and gave employment, among others, to W. A. Clark. Subsequently he moved to Lake Superior, where for forty years he was a notable figure. He organized the Atlantic, the Wolverine, the Winona, and Mohawk mining companies, he re-organized the Baltic, Michigan and Centennial, he was an important factor in the Copper Range consolidation and in the Michigan smelter. As agent for the various companies mentioned and as director of the Granby Mining Company he was a leader in the copper business. For a time he was the statistician for the copper producers of the United States, until the Amalgamated withdrew from the association. But to the mining industry even these important business achievements were of less value than the spirit of honesty and fair dealing that he exhibited, acting with other good men in making mining a clean pursuit as well as a highly remunerative speculation. In these days of shifting codes of morality and smart dishonesty, a man like John Stanton stood up like a bit of firm rock in a creeping morass. He was able to show that one could be clever yet straight, forceful and yet sincere, an outspoken critic and yet a true friend. All honor to his memory.

DAILY papers should be careful in making editorial comment on matters relating to technical science. Our neighbor *The Call* recently had some funny things to say on electric smelting, particularly in regard to the investigations made some time ago by Dr. Herault, in behalf of the Canadian Government. The scientist of *The Call* said that "Dr. Herault produces steel immediately from the ore as in the bessemer process. Whether this is done without the use of spiegeleisen as a neutralizer is not stated. Of course, the electrical heat is pure, without sulphur or other fumes or gases that affect the quality of the metal. There seems to be no reason why all of this is not possible. We are accustomed to the use of heat generated by electricity in cooking, and if the same or higher degree of heat can be introduced and diffused in the cupola the thing is accomplished." No sooner said than done. But electro-cooking and electro-smelting bear the same ratio as basking in a California sunshine does to the alleged calcining processes that proceed with so little interruption in a region where water is scarce and the society indifferent.

Changes at Pachuca.

Telegraphic advices state that the Real del Monte mines, at Pachuca, have been transferred to the United States Smelting, Refining & Mining Company, of which corporation Mr. A. F. Holden is general manager. This transaction has been pending for three months; it was initiated by Mr. Bernard MacDonald, who resides at Guanajuato, and taken up by Mr. F. W. Baker, of the Venture Corporation, Ltd. Mr. George A. Schroter, of Denver, made the examination of the properties, and when his report proved favorable Mr. Holden, representing Messrs. Clark & Coolidge, of Boston, closed the deal, on February 15. It is an important event, for it marks the transfer of mines that have been continuously in operation since 1739; it also means the invasion of modern mining and financial methods into one of the historic silver districts of Mexico. Pachuca produces about 6,000,000 ounces of silver and 30,000 ounces of gold per annum, the total value of the yearly output being $4,500,000. From the time of the early Spanish conquerors, more than three hundred and fifty years ago, to this day, the mines of Pachuca have been productive, despite several interruptions due to recurrent revolutions. The lodes are generously wide and the ore is not difficult to treat, for it has given a satisfactory extraction by the *patio* process. During recent years the richest mineral has been sent to the smelters, in Germany and in Mexico itself; concentration by vanners has preceded the *patio* and there has been a tendency to break away from antiquated methods. It is likely that this departure will be emphasized now that the principal group of mines has passed into foreign hands, but we trust that the advisory engineers of the new owners will not make the vulgar mistake of under-rating the intelligence of the Spanish-Mexican management, and therefore that they will be careful in superseding well-tried practice by hasty innovation. The transfer of these mines is likely to stimulate enquiry into the best method of treating the silver ores and will cause interesting investigations to be made into the pumping and other practice underground. The result should be a gain in knowledge and an increase of interest in Mexico.

IT is announced that General William J. Palmer and Dr. William A. Bell, both of Colorado Springs, have given that beautiful tract of land known as Manitou Park to Colorado College, in order that a school of forestry may be founded. Manitou Park contains 15,000 acres of mountain and lake, forest and plain; it is at the foot of Pikes Peak and in

the watershed of several large streams. No better site could be chosen for such a purpose. It is a princely gift from two men who took a prominent and useful part in the early development of Colorado.

A BOREHOLE put down from the bottom of the Cinderella shaft, at Johannesburg, from a depth of 3,900 feet and at an angle of 45°, encountered the Main Reef at a point 113 feet deeper. Six feet of quartz assayed 20.56 dwt. per ton, the 15 inches nearest the foot-wall assaying 92.78 dwt. The vertical depth from surface is 3,980 feet. At a similar great depth, of 4,000 feet, the Jupiter mine has developed the Main Reef where it is five feet wide and assays 25 dwt., besides the South Reef which at the same horizon is 2½ feet wide, assaying 44 dwt. per ton. Our friends on the Rand need some encouragement in these, to them, gloomy days; therefore it is a pleasure to note discoveries which promise to extend the depth to which profitable mining may extend. But they are a long way from the 6,000 and 8,000 feet involved in the academic discussions of a few years ago. Mines have their limit. Even the Rand is mortal. Methuselah lived to a ripe age, but even he had to go the way of all living things. But the Rand is getting older and the cheerful inconsequence of former days has been toned down by the Chinese and the Liberals, so we refrain from further comment likely to hurt a sensitive organization.

Blast Furnace vs. Reverberatory.

The development of practice based upon the use of these two types of furnace has progressed, on independent lines, so that both continue to hold their own in the metallurgy of copper. There was a time when the blast furnace threatened, by the increase of its capacity and consequent cheapness of operation, to drive the old reverberatory off the field, but the work done by Mr. Richard Pearce at Argo and by Mr. E. P. Mathewson at Anaconda proved conclusively that one type of furnace as much as the other was capable of the enlargement needed for large-scale operations. Of late the erection of new copper smelters has led to active investigation of the question by metallurgical engineers, as to the relativemerits of the two kinds of furnace, so that there ought to be plenty of data available for a useful public discussion. To start it, Mr. James W. Neill has prepared a set of twelve questions, which we publish in the hope that those metallurgists who are experts in the art of copper smelting will reply to them, emphasizing the particular points in which each man has had special experience.

There is no better way of getting at the essential features of any mining or metallurgical method than by instituting comparisons, for these bring out the facts, as a picture emerges from the darkness of a photographic plate when immersed in the developing liquid. We get a clear image of our ideas, discarding the accidental and emphasizing the basic principles that underlie every technical practice that has undergone logical growth.

Those who view smelting operations with that absence of prejudice which is only compatible with lack of knowledge, are to be forgiven if they regard the difference between blast furnace and reverberatory practice much as amateur artists who choose to work in oils in preference to sketching in water colors, because they think that any errors made in oils can be rectified by painting over the first attempt, while with the use of water colors it is recognized that any such botching will kill the purity of tone essential to a successful picture. The reverberatory is the pioneer device of the smelting man; the method it embodies is a sweating process, the germ of all elementary metallurgy, while the blast furnace, on the other hand, appeals to the mechanical engineer among metallurgists. If there is any trouble in the shaft furnace, either by reason of a badly proportioned charge or a refractory ore, it is possible, by elevating the temperature or modifying the feeding, to tide over the trouble. As the heat is applied from below and as oxygen is supplied through apertures—the tuyeres—that are under control, the conditions within the furnace can be changed without great difficulty. In the reverberatory, the heat is deflected from above—for that is what the word 'reverberatory' signifies—necessarily giving a low efficiency per heat-unit applied. By reason of the method of application, a great portion of the heat is wasted; this has been overcome to a large extent by the installation of boilers, placed in the flue, thereby intercepting the gases otherwise wasted, and generating up to 500 h.p. of steam in the larger and more modern reverberatory plants. Of late years, of course, the succession of hoppers that used to adorn the roof of a long reverberatory have become notably absent and the old ideas of keeping the hearth cool, removing all the matte and worrying the slag to the skimming-door have been discarded for tremendously long hearths, the retention of a constant balance of matte, the feeding of the charge only at the bridge-wall and an effort to secure a practically continuous exit of slag, so that the smelting operation proceeds uninterruptedly. All this is involved in the work done in the big furnaces at Argo and Anaconda, such as those described on another page by Mr. L. S. Austin, professor of metallurgy in the Michigan College of Mines. While blast furnaces have grown from dimensions at the tuyeres of 36 inches circular (with about 25-ton capacity per 24-hour day) to 58 inches wide by 52 feet long (smelting from 1,500 to 1,800 tons per day), the reverberatory has been enlarged from, say, 9 by 14 feet on the hearth (with a capacity of 10 or 12 tons) to 19 feet wide by 117 feet long (treating 275 tons). The hand of progress has quickened both, and in each case there has been a recognition of modern needs, exemplified in all our mining and metallurgical methods, of reducing the cost by the handling of a big tonnage. The chemical principles have undergone no revolution, beyond the recognition of the fuel value of pyrite, the ingenuity of the modern smelter superintendent having been directed chiefly to the mechanical problems, to elevating the ore to the feed-hole, to dumping devices, to the economical removal of the slag, and the manipulation of matte in converters, not forgetting the briquetting of fine ore before smelting.

This treatment of the fine is, after all, the chief problem today. Local conditions will modify the practice, of course, but, in the main, lump ore rich in sulphur will go to the blast furnace, while the fine, such as concentrate, will be fed to the reverberatory, particularly where oil is the cheapest fuel, as in California; or where pulverized coal is to be used, as in Utah. The old debate as to which furnace gives the higher slag will be revived, and it will be profitable only if actual results can be accurately quoted. The use of an auxiliary reverberatory furnace, with the addition of fine pyrite, to lessen the copper losses in the slag, is worthy of mention. The practice of water-cooling of jackets for the blast furnace is undergoing striking development. Many of the low-grade copper ores can be concentrated economically by milling before smelting; although the great capacity of the large blast furnace enables it to compete with water concentration on account of the greater saving made by fire as compared to water-concentration; so that the question is raised whether it is not cheaper to buy flux for refractory ores and secure a greater extraction than to concentrate with water and obtain an easier smelting mixture at the expense of high slime-losses and the many evils incidental to water concentration. This is done by crushing wet, sizing, and then separating the valuable mineral. In that case it becomes imperative to reduce the lump ore to fine, for without such reduction, concentration is impracticable; and yet, after it is thus concentrated, it must be re-consolidated before it is fit for the blast furnace. Here the reverberatory will score, until the blast furnace can be made to treat fine stuff by controlling and intensifying the heat at the tuyere zone. These and other problems are before the copper metallurgist; he has achieved much during the last two or three years; he can do more. Ten years ago the idea of smelting for a dollar per ton and mining for $1.10 per ton would have been scouted as impossible. Yet this has been done at the Granby mines, with an exceptionally favorable ore and exceptionally well-applied skill. In Tennessee, with low-priced labor and fuel, they smelt a copper-bearing pyrrhotite for $1.30 per ton. Such results are enough to stimulate interest and to promote healthy rivalry. Further improvement is only possible by comparing conditions and exchanging experience. Our columns are intended for this purpose, and we present the twelve questions as a text for vigorous discussion.

By the Way.

In our last issue we quoted, in this column, from an address by Mr. Martin A. Knapp, delivered before the American Association for the Advancement of Science. Mr. Knapp said much that was interesting and we do not apologize for giving our readers a further excerpt from his address:

The primitive man traveled on foot and moved his scanty belongings by carrying them in his arms or on his back. Even the rude vehicles and water-craft which he eventually learned to construct were propelled by his own muscle, and we can only guess how long it was before he obtained any other motive power for the transfer of his person or his property. In every way his life was meager and isolated, for he had not acquired the art of writing, and intercourse with his fellows was confined to ordinary speech. Outside the family to which he belonged, or the tribe with which he gathered, he had no community of interest, felt no friendship and desired no alliance. His associations were as limited as his means of conveyance.

In a later but still very remote period there came a great increase of motive power by the subjugation of animals, and their employment for transportation on land, and by the use of sails and rudders which multiplied many times the efficiency of water carriage. When these two results were secured, man had added to his own bodily powers the superior strength of beasts of burden and the enormous energy derived from the winds of heaven. This was an immense advance and marked the beginning of that wonderful civilization which slowly followed. The animal kingdom was brought into service for the various functions of land distribution, and the ship which could be sailed and guided made every waterway subservient to man's requirements. Early in this period also he learned to express his ideas by symbols or written words, and thus was enabled to transmit his thoughts by the same agencies that transported his possessions.

This leads to a fact of history which seems to me not merely significant, but profoundly impressive. With the subjection of animals and the use of wind-propelled vessels, both of which achievements reached a high degree of perfection in the unknown past, the means of transportation, broadly speaking, remained unchanged and unaugmented until almost down to the present time. Long before other agencies of conveyance were dreamed of, while ox and horse, oar and sail, were the only means of transport, the race had occupied most of the habitable globe and reached high levels of national greatness. Strong governments were established, vast populations engaged in various pursuits, and opulent cities crowded with every luxury. The institutions of society had acquired strength and permanence, the arts of leisure and refinement had approached the limits of perfection, and inductive science had laid firm grasp on the secrets of nature. Great inventions and discoveries had widened the fields of activity, furnished the means and incentive for multiplied vocations, and opened up in every direction alluring vistas of advancement. In a word, there was the developed and splendid civilization of only little more than threescore years ago, before any new or different motive power was utilized for production or distribution.

To my mind it is a matter of fascinating import that the long procession of progress down to the century just ended was conditioned by and dependent upon agencies of transportation which were themselves essentially unprogressive and incapable of important betterment. Reduced to the forms in ordinary use, there were at the last as at the first the beast of burden on land and the oar and sail on water. Yet thus hampered and restricted in the means of transportation, which is the basis of all development, there was built up in the long process of years the varied and advanced civilization which the last century inherited.

Then all at once, as it were, into and through this social and industrial structure, so highly organized, so complex in character, so vast in its ramifications, yet so adjusted and adapted to the fixed limitations of animal power, was thrust the new mode of conveyance by mechanical force, the sudden wonder of transportation by steam. The advent of this new and marvelous agency was the greatest and most transforming event in the history of mankind. It wrought an immediate and radical change in the elemental need of society, the means of distribution. The primary function was altered both in essence and in relations. The conditions of commercial intercourse were abruptly and fundamentally altered, and a veritable new world of energy and opportunity invited the conquest of the race.

No other triumph over the forces of nature compares with this in its influence upon human environment. It has directly and powerfully affected the direction and volume of commercial currents, the location and movements of population, the occupations and pursuits in which the masses of men are engaged, the division of labor, the conditions under which wealth is accumulated, the social and industrial habits of the world, all the surroundings and characteristics of the associated life of today. The world has seen no change so sudden and so amazing.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

THE friction of water in pipes increases as the square of the velocity of the water.

SMELTING is a universal metallurgical method, but is not always applicable, for commercial reasons.

GREASY MACHINERY may be quickly cleaned by directing against it a jet of steam from the boiler.

HOISTING cables in mines should have a factor of at least 5, and if to be run rapidly, not less than 7.

STIFF ropes for the transmission of power are not satisfactory as they require a greater amount of power to operate them.

A FRACTIONAL CLAIM requires the same amount of work annually as a full claim, no matter how small the fraction may be.

COARSE GOLD has been picked up on the surface at a number of localities in southern California and in Arizona and Nevada.

VERY LITTLE successful hydraulicking has been done in the Black Hills of South Dakota. It has mostly been on a limited scale.

THE United States of Colombia, S. A., is said to have produced more than $800,000,000 in gold, and Bolivia about $200,000,000.

THE symptoms of lead poisoning are not an increase in weight of the afflicted party (due to metal absorbed), but quite the contrary.

A HIGHER percentage of power is transmitted by long belts than by short ones of the same width and ply and running at the same speed.

ONE ton of gravel in the bank is usually figured at about 18 cu. ft. to the ton, though gravel is generally estimated by the cubic yard.

THE power required to effectively drive crushing rolls depends upon their speed and diameter and upon the character of material being crushed.

NO WATER for boiler use is superior to rain water. Nearly all water from the ground contains mineral salts in solution, which will deposit scale in the boiler.

THE first dividend of the Calumet & Hecla copper mine, at Houghton, Mich., was paid August, 1870, since which date it has paid over $92,000,000 in dividends.

A BELT concentrator requires generally from 200 to 300 gallons of water per hour. Large machines require more than smaller ones and heavy ores more than light.

IT is not permitted to cut timber on the public lands of the United States for sale to others. On the mineral lands timber may be cut for mine use, but not for sale.

THE quantity of water which may be introduced into a mortar of a stamp-mill must be determined by the character of the ore and the facility with which it amalgamates.

IT was claimed at one time that the New Idria quicksilver mine in San Benito county, Cal., could produce mercury cheaper than any other mine in the United States.

GRAPHITE is very useful about the iron foundry. Not a casting is made, large or small, where graphite is not employed to prevent the casting adhering to the mould of sand.

THE gold-bearing gravel deposits along the valley of the Rio Grande, in New Mexico, are said to be from 50 to over 600 ft. in depth. They are often cemented, and miles from water.

MANY miners believe that the veins in their claims were injected from below like dike rocks, and this idea is probably responsible for the term 'blowout,' applied to the croppings of a vein.

MOLTEN SLAG from blast furnaces, when treated with a jet of steam, becomes a finely fibrous, silky mass, known as mineral wood. It is used as a non-conductor of heat, on boilers, pipes, etc.

CLAYS which resist the heat of ordinary furnaces are called refractory. Many volcanic rocks, chiefly tuffs, resist heat admirably and these are therefore suitable for furnace linings and the like.

THE stockholders' liability in California makes each share holder in a corporation responsible to each creditor of the company in exact proportion to his holdings of the capital stock of the company.

HEAVY SURFACE INFLUX of water into a shaft may be kept out either by driving sheet-piling or by constructing a double line of close lagging with clay packed between, forming a 'coffer-dam' structure.

ZINC is not suitable for use in contact with copper, lead or iron, owing to the strong galvanic action taking place when zinc comes in contact with either of these metals, particularly in the presence of moisture.

BROKEN ROCK always occupies a larger space than it did in place, but fine material, sand, loam and gravel require less space than when undisturbed in the earth. This shrinkage amounts to 5 to 15%, with different materials.

MOST millmen prefer to save all the gold possible inside the mortar. Outside amalgamation is mostly practiced on low-grade ores, where large capacity is desirable. Feeding 'quick' by guess has long since become obsolete.

IN arranging a metallurgical plant, the engineer must look into the future requirements of the property, and not only arrange the plant so that gravity may be taken advantage of, but also keep in mind future possibilities and design accordingly.

TIN has a low melting point—446° F.—but when exposed for a long time to extremely low temperature it will be found covered with blisters, and it becomes very brittle, and has even been known to disintegrate. It also becomes brittle when heated.

IT depends whether it is desirable to break the rock in the quarry coarse or fine whether high-grade or low-grade powder be used. Powder containing a high percentage of nitro-glycerine will break rocks into smaller pieces than the low-grade powders.

IT has been claimed that Mexicans washed placer gold from the gulches about Newhall, in San Francisquito canyon, and in the Castec region, in western Los Angeles county, Cal., years prior to the discovery of gold at Sutter's mill, in El Dorado county, in 1848.

IN forging rock-drill bits those for medium hard rock should have sharp chisel bits. As the hardness of the rock increases, the angle of the bit may be made more blunt, and the cutting edge shaped from a straight line to a curve, to prevent the corners being chipped off.

THERE is no standing Government reward for the discovery of tin in the United States, nor has there ever been, though such appears to have been the impression for many years. The greatest incentive to the discovery of tin is its present price, about 36c. per pound.

IT is said 'mining is a gamble,' which in a certain sense is true. All business enterprises are to an extent gambles—that is, all possess those elements of uncertainty which make business attractive. No business is more honorable, nor offers better opportunities than legitimate mining.

BEAUTIFUL vein structure and wall rocks the same as this or that great mine are not indicative of as great value, or, in fact, any value at all. Each mine must stand on its own individual merit, and geological conditions similar to those elsewhere are not trustworthy evidence of a valuable mine.

THE auriferous quartz veins of the California gold belt contain from 1% to 2% sulphides which are worth from $20 to $200 per ton, averaging about $70. There are exceptions, particularly in the veins in granite, where the percentage of sulphides may be higher, and sometimes the values also.

ORES, which are refractory when treated alone, if sent to smelters are mixed with numerous other ores, together with fluxes, the refractory ore forming only a small percentage of the whole mixture, and as a result offers little difficulty to treatment. This is an advantage other methods of reduction do not possess.

TEMPERING of steel tools is an art which one may acquire under a competent instructor. There is considerable difference in the character of steel made by various manufacturers. The drill-sharpener must become acquainted with each kind of steel and its peculiarities before he can do the most satisfactory work.

THERE is gold in the glacial lake bed deposits covering a large portion of the Leadville district, but they have not been found sufficiently rich in the metal to pay. The early placers derived their gold more directly from the gold-bearing igneous rocks lying on the range east of the city, and not from the gravels of the glacial age.

IT has been claimed that stone mortars, supposed to have been used by a prehistoric race, have been found in some of the ancient river channels of California. These reports have not been verified sufficiently to give the statements absolute authority. It is believed that some of the so-called stone mortars are merely imitative shapes accidentally produced by the unequal wearing away of a boulder in the stream.

THE portable firebox-boiler, sometimes called locomotive boiler, is convenient, but is extravagant of fuel. All such boilers should be provided with a damper in the stack, and, unless for only short, temporary use, a water-heater as well. The return-flue boiler is far more economical in operation, though more expensive in first cost.

THE locality producing the largest mass of native copper is in dispute. Some very large masses have been found in the Lake Superior mines and also in southeastern Arizona. Ordinarily the mine owner prefers small disseminated grains to great masses, as the latter are expensive to extract from the mine and frequently yield no profit.

TIMBERS are sometimes secured together by means of drift bolts. This is an iron rod with a chisel or four-sided point, which is driven into an augur hole bored in the timber, but of somewhat smaller diameter than the bolt. Smooth, round iron is better for this purpose than square bars or that having jagged edges which tear the wood in driving.

THE first to introduce winding and dry washing for gold in the United States were the Mexicans and Indians in the Southwestern mining regions; but white men soon invented various mechanical devices for this purpose. These machines give a larger capacity and generally better results than are obtainable by the primitive hand methods practiced by the Mexicans and Indians.

NEVER rush a missed hole—give it plenty of time, and all night is not too long sometimes. The missed hole is one of the greatest menaces to the miner. When safe to examine the hole, carefully withdraw the tamping down to the powder, insert another primer, and after re-tamping the hole fire it again. Should it go, the chances are in favor of all the powder in the hole being exploded.

THE price of cordwood usually varies according to the wages of the country where it is cut, and with the cost of hauling it to the market. Wood may be worth only $5 a cord where wages are $3 per day, and in another locality, where woodchopper's wages are but $2, the wood may cost $6 or more delivered, on account of the long distance it has to be hauled. The same applies to mine timbers.

CARRYING stopes to the surface from the upper levels of a new mine is bad practice, particularly in a wet country, as it will result in allowing much storm water and surface drainage to run into the mine, which is something to be avoided, and particularly where there is no drainage outlet, such as a tunnel below. The surface works of numerous mines have caved from the cause here referred to.

THE wear of shoes and dies in the battery varies greatly, partly with the character of the ore, and partly with the material from which shoes and dies are made. Chrome and manganese steel shoes and dies are less affected than those of iron. The cost is from 0.5 cent to 2 cents per ton of ore crushed. Quartz ores naturally are more destructive of shoes and dies than the softer slaty ores.

WHERE a ditch or road existed prior to a mining location covering it, the ditch or road may be maintained. The question of abandonment of a ditch or a mining location is partly decided by the intention of the proprietor; but his intention, to a great extent, may be evidenced by his compliance with the legal requirements. Neglect to comply with the demands of law will defeat the locator of the claim, even though he may say he had no intention of abandoning the location.

THE Supreme Court of the United States has decidde that the several States may make laws governing the location and holding of mining claims, which are not in conflict with the Federal laws. A State or territorial legislature may therefore enact laws which require more of the locator of a mining claim than is required by the Federal law. These additional requirements are in the way of performing certain work within limited time (60 to 90 days) as a part of the act of location.

THE statement that the copper ore in any particular locality resembles that of Butte, Montana, has no particular significance, as copper ores are characteristic everywhere. Green or blue carbonate looks much the same wherever found. Chalcopyrite, and bornite and chalcocite are immediately recognized by those familiar with sulphide copper ores, whether at Butte, in Chile, in the heart of Africa or any other place on earth. The associated gangue minerals may be far more characteristic of a locality.

SNOWSLIDES annually do much damage in Colorado, and loss of life is not of infrequent occurrence from them. Many ingenious arrangements are made to protect mine buildings from destruction by snow. This is done by building under the protection of jutting rocks, or by cutting out a grade in the solid rock itself. Some of the mine buildings are actually suspended from the cliffs. In the event of a snowslide, the great rushing mass of snow slips over the rocks, but does not reach the building below. At most of the best mines operations are continued throughout the long winter at altitudes varying between 8,000 and 12,000 feet.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

BLAST FURNACE *vs.* REVERBERATORY.

The Editor:

Sir—Progress in the art of smelting copper ores has been most rapid in the last two or three years; the achievement has been largely in the line of increase in the size of furnaces—both blast and reverberatory—and consequent decrease in costs of operation. With this increased production per furnace the improved handling of materials has had to keep pace, and the mechanical engineer has proved an efficient partner to the metallurgist. The question as to the relative merits of the blast furnace versus the reverberatory is coming into prominence by reason of the enormous increase in the tonnage smelted by the latter, and its better fuel ratio, as well as the possibilities in the way of steam generation. Naturally, the choice of the style of furnace must depend on the size of the ore-particles, fine going to the reverberatory, and coarse material to the blast furnace. Thus the smelting of concentrate has naturally fallen to the reverberatory, and with this also the smelting of flue-dust and such of the fine as can be screened from the crude ore. Is this division justified by the results? There are, among metallurgists, partisans of each type of furnace, with decided ideas on the subject Could you not start, through your columns, a discussion of this important matter in somewhat the same way as you treated the question of pyrite smelting? I would like to suggest the following questions as among those to be asked, though I am, of course, aware that the financial results of many smelting works cannot reasonably be given to the public, except in a general way:

QUESTIONS—BLAST FURNACE *vs.* REVERBERATORY.

1. On what should the choice of furnace type be principally based? Character of the ore, fuel, fluxes, building materials?
2. What are the comparative costs per ton of daily capacity of each type of furnace? In the case of the reverberatory, this cost should include the expense of the necessary roasting plant.
3. What is the comparative space requirement for an equal tonnage?
4. What is the comparative cost of mechanical equipment for equal tonnages?
5. What are the comparative costs of power, labor, fuel and repairs?
6. What are the comparative amounts of capital tied up in furnaces of each type, and how does this affect the cost per ton of daily capacity or of output?
7. What are the limiting necessities in the way of fuels for each type?
8. What are the comparative losses in slag, dust, or middle products?
9. What are the defining limits of each type in regard to slag composition?
10. How do these differences of slag figure out in financial margins per ton smelted?
11. What method of charging do you advocate for a copper furnace (assuming the atmosphere to be oxidizing)?
12. Would you bind, in some manner, all fines for use in the blast furnace? Incidentally, what are the difficulties of treating fine ore in the blast furnace?

JAS. W. NEILL.

San Francisco, January 11, 1906.

BLAST FURNACE *vs.* REVERBERATORY.

The Editor:

Sir—Herewith I beg to submit some data showing the assays and analyses of reverberatory and blast-furnace slags made in one of the smelting works at Butte during the same relative periods, and thus affording a fair comparison of the work done by the two types of furnace.

The figures given in the first table are actual averages, made up from weekly averages. These were made by saving equal parts of all daily samples from all furnaces, and mixing them. Copper determinations were made on these weekly samples by electrolytic methods; on the daily samples color tests were made. The slag samples from the reverberatory furnaces were taken from the stream as it overflowed from the first or settling slag-pot; those from the blast furnaces were taken from the stream overflowing from the settlers. The shells from the first pots of the reverberatory were saved, dumped on the surface and sorted, any 'prills' or foul bottoms being returned to the works for smelting in the blast furnaces.

The second table shows the constitution of these slag-shells as taken from the first reverberatory slag-pots; all the shells from one day's work of all the furnaces were saved, dumped, sorted, and the different materials were sent through the sampling mill. Special interest attaches to the assay of the tops, for these contained much undecomposed quartz, drawn from the furnace in the shape of 'floaters.' This material is supposed to be thoroughly liquated of all the metals, and the ability to get rid of such silica in this manner is one of the boasted advantages of the reverberatory system. Later practice does not make so many of these 'floaters.'

The next figures show the actual contents of the shells of all first pots of reverberatory slag for one day, without any sorting; all of them were sampled in a mill. This material would probably pay for re-treatment in the blast furnaces, when not already burdened with converter slag, etc.

To check the slag usually poured to waste, that is, the overflow from the first pot of the reverberatory, a clean ladle was substituted for the second slag-pot, all the slag of one skimming was caught in this and then poured into cast-iron moulds, which were sent through the sampling mill. The assays and analysis of this material are given in the last row of figures, and a comparison is made with the results of the daily assays for the same day. Comment seems unnecessary. The slags from the blast furnaces were always dumped without saving shells. Tests on larger quantities of this material were not made.

The marked difference in the general composition of the slags for the two general periods is accounted for by the fact that the former practice of smelting mine-fine was largely discontinued, and this material was sent to the concentrating mill instead, more concentrate being produced, and a larger proportion of it being used on the charge. The differences in the assay-values on the reverberatory slag are, however, not alone due to the increase of iron content in the slag, but also to the method of feeding the ore in smaller and more frequent charges, these being dumped close to the bridge, thus transforming the back of the furnace into a settler. This is the Anaconda method, and on their large furnace it should result in yielding a cleaner slag.

I will leave to each metallurgist the task of figuring for himself the value of the difference in metal values between the two types of slag given above, as each man has his own notions as to 'margins' and prices to be used in such computations, but I think it is pretty safe to predict that it will not be found to be less than $1 per ton of slag, in favor of the blast furnace. The average of the ores at Butte is about 65% silica and 15% iron; the loss in concentration is not far from 20% of the metals, the concentrate produced being the only iron flux; limestone costs about $1.10; it will, therefore, be seen easily that the value of the iron as a flux is used to much better advantage in the blast furnaces than in the reverberatories, and this should be credited to this type of furnace-slag. The question as to whether it would not pay better to briquette all concentrate and fine, and put them into the blast furnaces, rather than submit to such losses, is one not readily answered.

	Ag. Oz.	Cu. %	Slag FeO %	Slag SiO_2. %	Slag CaO. %	Slag Al_2O_3. %	Slag Zn. %	Matte Ag. Oz.	Matte Cu. %
Reverberatory, 1904	0.348	0.716	35.5	46 6	4.17	8.6	1.6	25.8	45.0
Blast furnace. 1904	0.116	0.315	23.1	46.2	18.3	7.4	1.0	21.7	41.0
Difference	0.232	0.401	12.4	0.4*	14.1*	1.2*	0.6*	4.1*	4.0*
Reverberatory, first ½ of 1905	0.352	0.582	41.0	42 2	3.34	7.42	2.25	33.6	41 5
Blast furnace. first ½ of 1905	0.114	0 302	25 9	44.5	17.1	7.02	1.48	28.2	36.2
Difference	0.238	0.280	15.1	2.3	13.8*	0.40*	0 77*	5.4*	5.3*

Those marked (*) are in favor of the reverberatory. As charges were not identical, difference in matte is not actual.

SHELLS FROM ALL FIRST POTS OF REVERBERATORY SLAG SORTED ON DUMP.

	Ag. Oz.	Cu. %	FeO. %	SiO_2. %	Lb.
Top	0.3	0.64	30.6	56.0	17,200
Center	0.3	0.89	39 3	44 4	14,750
Bottom	0.7	1.85	41 5	42.0	9,900
Actual average	0.4	1.01	36 3	48.6	41,850
Analysis reported on daily samples	0.3	0 30	33.8	47.9	

SHELLS FROM ALL FIRST POTS OF REVERBERATORY SLAG ONE DAY WHEN NOT SORTED.

	Ag. Oz.	Cu. %	FeO. %	SiO_2. %	Lb.
Analysis	0.4	1 28	36.1	48.4	57,845
As reported on daily samples	0.2	0.50	32.2	53.6	

SLAG OVERFLOWING FROM FIRST POT CAUGHT IN LADLE, POURED IN MOULDS AND SENT THROUGH SAMPLING WORKS.

	Ag. Oz.	Cu. %	FeO. %	SiO_2. %	Lb.
Analysis	0.6	0.99	30.3	47.4	21,000
As reported on daily samples	0 4	0.76	35.4	46.3	

JAMES W. NEILL.

San Francisco, February 15, 1906.

MINING ENGINEERS AND GEOLOGISTS.

The Editor:

Sir—It is unseemly for 'mining geologists' and 'mining engineers' to dispute concerning trespass from either side upon contiguous or overlapping territory. May it not be that each is worse hurt by his own excursions than by his confrere's incursions, over the border line? I am tempted to draw upon personal experience for illustrations, trusting that nothing of controversial value will thereby inure to either side.

Case No. 1.—A mine, or group of mines, involving millions of dollars, was examined by several geologists and engineers, and reported upon unfavorably by some, favorably by others. The geologists who were not engineers all reported adversely, mainly because the geologic structure was complicated and the dynamic effects of successive uplifts were difficult to estimate. The engineers were not all favorable, those reporting adversely basing conclusions wholly upon the average of all mine samples and treating the property as a mine of ordinary type. The favorable reports were made by engineers who considered the mine by itself as a problem, with due reference to its individual geologic features, after *measuring* dynamic relations of each disturbance. The history of the mines has fully justified the favorable reports. But, in working it, geologic relations being too much disregarded, much useless and unprofitable excavation was undertaken, unnecessarily reducing the realizable profits.

Case No. 2.—A mine which yielded profitable ore was operated by an engineer who lacked geologic training. After much systematic development, admirably executed, the ore gave out and could not be regained. Upon the advice of a mining geologist, not trained as an engineer, the original operator (engineer) opened ground in an unworked direction with very satisfactory results.

Case No. 3.—Mine worked in good fashion by an engineer, not a geologist. Misinterpreting geologic conditions, the workings left the vein and mine was abandoned. Afterward the geology was carefully put upon the mine maps by a competent person, and the error in working thereby detected. The mine was then worked successfully.

Case No. 4.—Mine located and worked in accordance with results of geologic study, following structural lines. Results disastrous. An engineer reopened and successfully followed the orebody by systematic exploration.

The necessity, if such exist, for any controversy as to the respective merits of geologists and engineers in passing judgment upon mining enterprises, arises absolutely and entirely from the nature of the problems involved. The adaptability of either as professional practitioners is altogether a personal side-issue. The difficulty of deciding which should be consulted in any given case is inherent in the business of mining, not in any hard and fast boundaries of the professions. However, there may be some danger in the personal factor, if it inhibit the admission of ignorance, upon one side or the other, of what is necessary to form a dependable commercial opinion.

Certainly the mining geologist, *as such*, can lay no just claim to understanding of the intricate and complicated problems which it is the particular province of the engineer to solve in terms of profit and loss—the critical test of all mining operations.

On the other hand, the well-equipped mining engineer, *strictly as such*, must always base his operations upon certain knowledge of geologic facts. And it is evident enough that employers of engineers have heretofore usually expected this necessary information to be acquired by the engineer himself. If the profession of the practical economic geologist has at last become virile enough to assert its rights to be recognized as a business factor, right royally may mining engineers welcome its votaries as indispensable allies.

But, unfortunately, there are so-called 'mining geologists' of the highest reputation and of undoubted abilities, who persist in demanding recognition as practical business guides in mining enterprises without the training and experience necessary to qualify them. We frequently see in prospectuses of mining companies that such or such an "eminent geologist" or "celebrated mining engineer" has reported favorably upon the property in question. None need be deceived by such statements, for it is easy to demand a view of the actual report.

My own practice is invariably to deny that any man has real standing as an engineer who will sign a report in such vague terms, with no details from which a brother engineer can draw safe conclusions. The geologist may produce abundant evidence in his reports of ability to read the structural record and he may have a reputation beyond question, and still be a very unsafe guide in the matter of investment. It is a sure mark of incompetence in an engineer to write that "the mine ought to pay well if properly managed," leaving the reasons for such belief and the methods of proper management unstated. But this is exactly what has become the stock in trade for conclusions in geological reports. The facts of geology are of vastly more importance than some engineers appear to realize: but, if they present good foundation for a business enterprise, they must serve as an introduction to the vital discussion of ways and means of converting capital into dividends and amortization funds.

Which all goes to say that any attempt to make controversy out of the right relations of geologists and engineers will carry one around the circumference of a circle, ending where it begins.

Many mines have failed mainly through lack of close attention to accounts. But this is not saying that, with favorable resources, the company which employs a competent accountant will always be successful. Put 'geologist' in place of 'accountant' in the foregoing, and the statement holds good. Substitute 'engineer' for 'geologist,' the comparison fails. *Ergo*, what is gained by trying to subtract four loaves of bread from four pounds of meat.

THEO. B. COMSTOCK.

Los Angeles, February 24, 1906.

THE SURVEY AND THE TECHNICAL PRESS.

The Editor:

Sir — You state in your editorial of February 17 that one or two officers of the Survey attempted to control a Chicago mining paper.

This statement was made last summer in the daily press, and was satisfactorily replied to by the Director through the Associated Press. Recognizing the excellent standard of accuracy and fairness of the MINING AND SCIENTIFIC PRESS makes me call your attention to this reply and to add an absolute denial of any such attempt to bring the *Mining World* under the control of officers of the Survey, or to change its control in any way from the present owners.

I know that you will welcome this correction and be more than glad to convey it to your readers.

DAVID T. DAY.

Portland, February 19, 1906.

(We publish this without caring to make further comment.—EDITOR.)

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—This certainly is a topic worthy of discussion. We have become so accustomed to the rectangular opening of two, three or more compartments that it is seldom the mine manager gives thought to the possibility that there may be better forms of shaft than the rectangular shaft of ordinary type. We all know there are other forms than that here referred to, but they are mostly in distant countries, and few American engineers have had experience with these large, circular, square and octagonal-shaped shafts, and comparatively few have ever seen them.

When deciding upon the shape and size of a prospective shaft, consideration must be given the cost and the maximum amount of ore, rock, etc., to be hoisted, and materials and men to be handled through it in any single day.

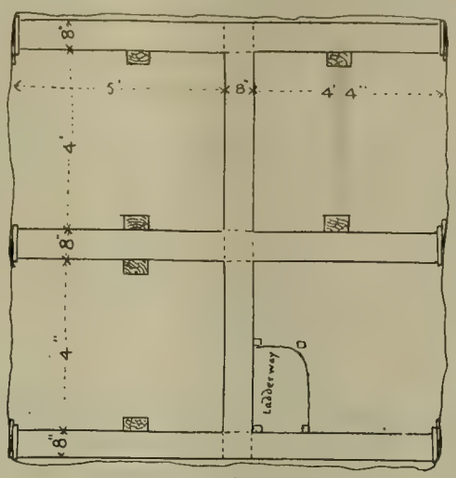
Occasionally a shaft of some sort has previously been sunk on the site of the proposed deep shaft, and it is desired, if practicable, to make use of this. Such was the case stated by Mr. R. H. Burrows as occurring at Guanajuato, in your issue of February 24. This old shaft is described as being 10 ft. square and 320 ft. deep, and sunk in "ground so hard that no wall-plates were necessary in the shaft." Certainly under such conditions it would be desirable to utilize the old shaft, as it would in any event mean a saving of at least $30 per foot in sinking and probably more —a matter in this instance of perhaps $10,000.

The shape of the shaft is important, and a decision on this point can only be safely reached with a knowledge of the ground through which the shaft must pass, which is usually impossible. In heavy or swelling ground no shaft is sunk with greater facility than the rectangular shaft of two, three or more compartments, and shafts of this type have been found to fulfil every essential requirement at many great mines. Openings of other shape have been sunk to a depth of 1,500 to 2,000 ft. and more, but their superiority over the plain rectangular shaft has, so far as I am aware, never been demonstrated, either as to first cost, adaptability for the work, or amount of rock that may be hoisted through them I confess I favor the rectangular shaft with a single line of compartments. This may be old-fashioned, but it is known to be satisfactory.

Mr. Burrows says it was desired to sink a shaft through which 1,000 tons might be hoisted daily, if necessary. A shaft such as suggested by him, namely, 5 by 16, would certainly be large enough to admit of this amount of rock being hoisted without difficulty. Two hoisting compartments, each 5 by 4.5 ft., will accommodate skips of five-ton capacity, if all the space available be utilized. There would be three compartments—the two hoisting sections, as described, separated by nine-inch dividers, to which are attached the guides, at least 4 by 6 in. This would leave the pump and manway compartment 5 ft. by 4 ft. 9 inches.

The manager's plan to enlarge the cutting to 10 by 16 ft. is ingenious, and at first glance seems feasible; but no provision is made for timbers to carry the guides, pump column, etc., which must be provided in any case. These supports must be of either timber or steel. Another thing apparently overlooked is the necessity of cutting double stations and ore pockets underground, and it also requires the installation and maintenance of two separate hoisting plants on the surface.

To place sprags, or dividers, in the shaft and to set them in exact alignment would in the end be quite



Sketch of Steel Structure for Shaft.

as expensive as timbers and far less satisfactory. On the whole, the 10-by-16-ft.-shaft idea as outlined has little to recommend it. It involves much unnecessary expense, is far larger than the demand requires and the plan should, in my opinion, be dismissed without further consideration.

It may be contended that a shaft of the dimensions stated (5 by 16 ft.) is not large enough for the hoisting of 1,000 tons per 24 hr. I believe it to be sufficiently large, not only for that amount, but for much more, if necessary. Assuming that the skips have a capacity of only four tons each, and the maximum winding speed to be 1,500 ft. per minute—a very moderate speed these days—or say that a round trip, including loading and discharge, can be made with each skip from the deepest level (2,300 ft.) in five minutes. This is 48 tons per hour for each skip and 96 tons for the two. Running steadily, 1,000 tons could be hoisted in about 10½ hours. Assuming that two hours are consumed in lowering and hoisting men alone, this makes only 30 minutes over 12 hours to do all the hoisting for the entire 24 hours, leaving 11 hr. 30 min. for repairs, oiling machinery, 'doping' the rope, handling materials, etc. I think I am placing this proposition on a very conservative basis, as at Kimberley they have found no difficulty in hoisting more than 4,000 tons through one rectangular shaft from a depth of about 1,500 ft., week in and week out—this being their daily performance, anything else being an exception.

In Volume XXX of *Trans.* A. I. M. E., p. 986, I find this note by Thos. H. Leggett, taken from the De Beers Con. Mine Co.'s eleventh annual report:

"At the De Beers mine on May 17, 1899, 9,261 loads of blue ground, equal to 7,409 tons of 2,000 lb. each, were hoisted from a depth of 1,200 ft. by one engine (working in two compartments) in 24 hours."

This hoisting was done from a single loading station, which is, of course, a great advantage; but it is evident that there should be no difficulty whatever in hoisting 1,000 tons from depths down to 2,300 ft. through a three-compartment shaft of the dimensions above described, working in two hoisting compartments, provided the engine be suited to this heavy duty. When greater capacity is demanded, it is always better to increase the load than the running speed.

Returning to the Mexican shaft, I do not approve of the offset suggested at 320 ft. in the shaft, and believe it would eventually be a most unsatisfactory arrangement. Bailing is in many cases more satisfactory than pumping after the shaft has reached its greatest depth, or, at least, a depth at which it is likely to remain for a long time. A large water-skip could be placed in the third compartment, or one of the rock-skips could be swung out of the shaft at the collar and a water-skip swung in. This can be quickly accomplished where the necessary provision is made for thus changing skips. With a 1,500-gal. water-skip, there should be no difficulty in hoisting 20,000 gal. per hour from a depth of 2,300 ft., and with proper hoisting equipment, much more than this can be handled by bailing.

On the Comstock lode, at Virginia City, the Foreman shaft was sunk in the form of an L. There were three compartments in a line, in the usual manner, with a large compartment at one end for pumps, etc. The experiment was not repeated. It was found that the unequal pressure on various portions of the shaft caused the timbers to rack badly, and repairs were frequent and costly. Where ground is heavy, the compartments had better be longer across the shaft and narrow, as this places the dividers closer together and the timbers are better able to withstand the thrust; but in cases where the ground is so firm that wall-plates may be dispensed with, the form of shaft may be that which suits the fancy best, though I still maintain that the three or four-compartment rectangular shaft has no superior. As to size of the compartments, that is another consideration. Where large amounts of timber and other supplies must be daily sent down into the mine, it is well to have one large compartment and separate engine for this work. It would be well to make this compartment so large that a trolley or flat car could be run onto the cage with the timbers lying flat upon it, instead of standing on end in the usual manner. This would save much time in handling of timbers.

The pump, or bailing compartment, also provided with separate hoist, might to advantage be placed between the two rock-hoisting compartments. Where cylindrical or cone-shaped winding drums are used, this arrangement will admit of the drums being so disposed that there will be less side draught to the rope on the sheave, due to the travel of the rope across the face of the winding drum. At many large shafts the pumps and pipes are handled by a separate and usually somewhat smaller engine. This is an advantage, and is economical, as it saves waste of power and wear of machinery.

If it is desired to utilize the 10-ft.-square shaft, this might be done by first dividing it into two compartments, one of which would be 5 by 10 ft. clear, and sub-dividing this into two compartments, each 4 by 5 ft., employing a light frame of steel I-beams. These would take up less room and probably be less expensive than the ordinary shaft sets of timber placed five feet from center to center, as the steel frame might be constructed 15 ft. from center to center. By this means two hoisting compartments could be obtained, and one compartment 4 ft. 4 in. by 10 ft. for manway, pumps, etc., and, if desired, the large compartment might be so arranged that a service cage could be operated at one end for handling men and materials, and the pump-column, air-pipes, wires, etc., placed at the other. This idea does not contemplate wall-plates, but does provide for ends and a divider, which, if supplied with square plates at the end of each section of steel, adjacent to the wall, could be tightly wedged. To these pieces could be attached the guides, bolted and riveted to the beams.

A steel center column would carry all of the several beams, five in all, which are wedged to the walls by blocking in the manner usual with butt-caps or sprags in stopes. The arrangement permits the stations to be cut on one side of the shaft—that nearer the hoisting compartments—and the winding machinery on the surface could all be placed on one side, that operating the service cage and handling the pumping equipment being between the shaft and the main winding engines. On this plan the shaft need not be enlarged, but continued to any desired depth, 10 ft. square. The accompanying sketch illustrates the contemplated division.

W. H. STORMS.

San Francisco, February 26, 1906.

Real del Monte, Near Pachuca, Mexico. Referred to on First Editorial Page.

Recent Improvements at Anaconda.

Written for the MINING AND SCIENTIFIC PRESS by LEONARD S. AUSTIN.

In the MINING AND SCIENTIFIC PRESS, Vol. LXXXIV, page 202, in 1902 will be found a description of the plant of the above-named company, at that time just completed, and representing the most advanced practice of that day. The plant has remained, in its general features, much as then constructed, but its furnaces, both blast and reverberatory, have been enlarged so as to greatly increase the output.

Three years ago the plant came under the charge of Mr. E. P. Mathewson, upon whom devolved the work of bringing the organization up to its present condition of efficiency. This he brought about by measures looking to improvement in discipline, and to the harmonious working together of the different departments.

Then came up the question of larger and cheaper operating furnaces. The first to be considered were the reverberatory matting furnaces, already the largest known, with hearth dimensions of 20 by 50 ft. They were smelting 105 tons daily with a consumption of 27% of coal. Accordingly, one of the furnaces was lengthened out to 65 ft., and, with the encouragement thus afforded, to 85 ft., and, finally to 102 ft. length of hearth. The width was, however, not increased because of the thrust due to the weight of the roof. With this to go on, upward of $120,000 was spent in changing the 14 furnaces (each 20 by 50 ft.) to seven large ones, each 19 ft. wide, and varying in length from 102 up to 117 ft. This was done by throwing two furnaces with the intermediate space into one large one, so that the seven large furnaces had one-fourth more area than the smaller 14. As a result of these changes each large furnace now puts through 275 tons daily with a consumption of but 21% of coal, this item having been reduced to a cost of $1 per ton of charge. The fire boxes are 7 by 16 ft. in size in order to burn the large amount of coal per furnace, some 56 tons daily.

Washoe Plant, Anaconda, February, 1906.

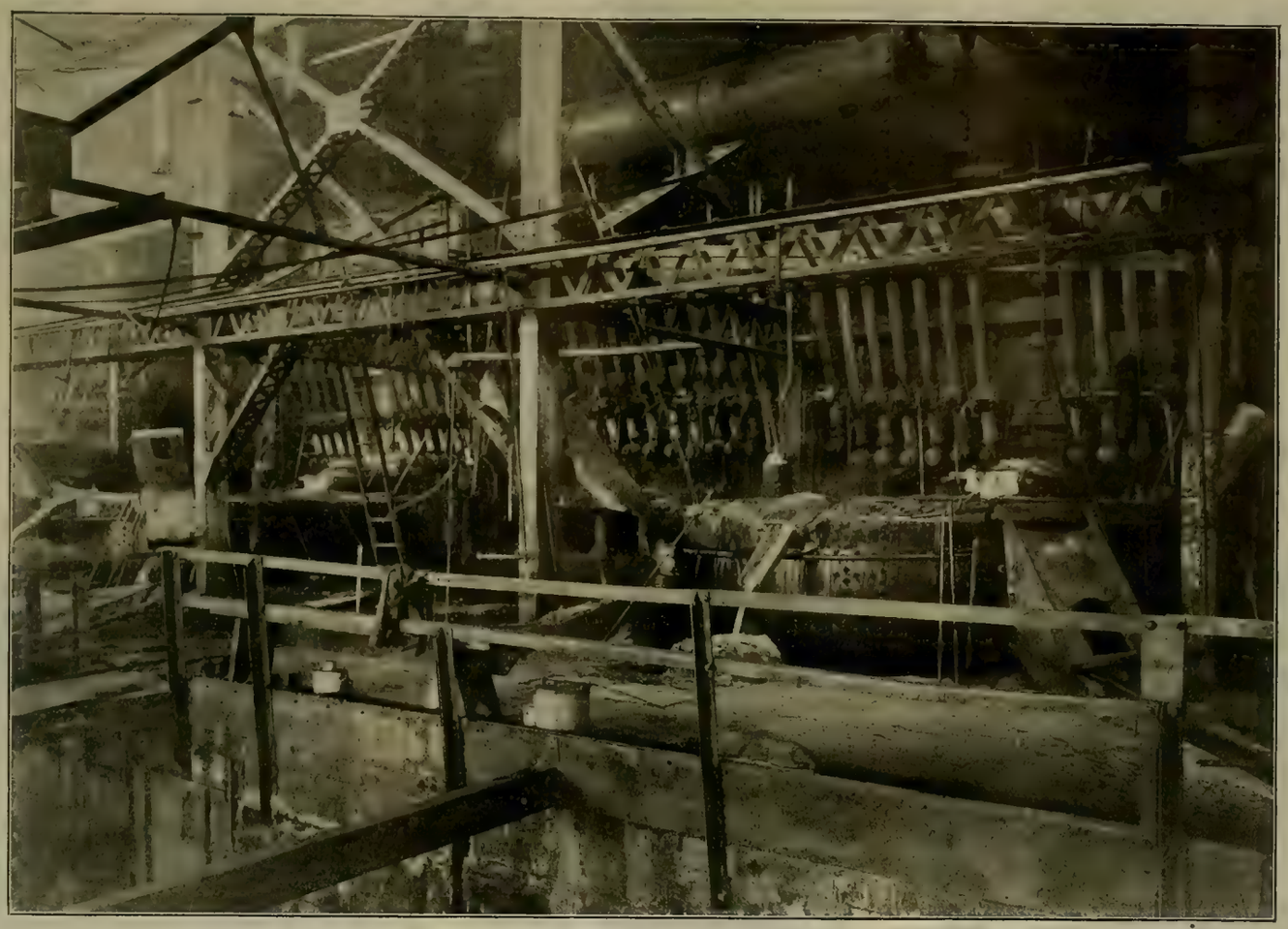
The next question to take up was the blast furnaces, seven in number, each 15 ft. long, 56 in. wide, with a capacity of 420 tons each daily. The changes at the reverberatory plant would naturally suggest the same idea of throwing two blast furnaces into one, but the question was, whether so long a furnace as 51 ft. would work, and whether so large a unit would not, with some mishap, cause a decrease of tonnage out of proportion to any advantages otherwise obtainable. To find out in advance, it was necessary to know if a jacket, needing repair, could be removed from existing furnaces without taking off the blast. Fortunately, the jacket gets crusted over, forming a shield against the fire so that the experiment was successful. Following this it was necessary to find out whether a part of the hearth, or of the furnace, could be cleaned out, while the rest kept on smelting, but, of course, in the 15 ft. furnaces with a large decrease of tonnage. With this to go on, it was decided to make the change. The space between the furnaces was bridged over, the jackets set up, and the closed-top and downtake added. This completed, the change to a larger furnace was made, taking down the end-jackets. In this way, with little interruption, a new furnace was designed, the 21 ft. intervening being thrown into one with the two original 15 ft. furnaces, making 51 ft. in all. A heavy blast-pressure, of about 40 oz. per sq. in., is used, and the new furnace has an output of 1,600 tons daily with a maximum, per furnace, of 1,850 tons. Besides the fact that it was possible to take down a jacket and to clean out a portion of the furnace while the rest was running, other advantages have shown themselves in operation.

With an increase of output equal to 3.8 times, the jacket-area in contact with the charge has increased but 2.4 times, so that, proportionally, less jacket-water is needed. Again, we may compare the large furnaces to those three small ones in which there have been omitted four out of the six end-walls of the latter. Now, since the end-walls are a fruitful cause of accretions, the improvement in this respect is evident. Furthermore, accretions are gotten rid of much more easily, either by barring off, or by smelting them on the long side-walls. The large furnace has retained the two fore-hearths or settlers belonging to the smaller two furnaces, and which are 16 ft. diam. by 5 ft. high. The increased flow through these settlers keeps them hot and in good condition, and has not interfered with a satisfactory separation of the matte from the slag. Were it desired to change the fore-hearth, this can be done by stopping the furnace tap-hole and compelling the mixed stream of matte-slag to flow through the other settler until the change can be effected. The mid-portion of the furnace, as already stated, has a bridge at the hearth-level, water-cooled to withstand the corrosive action of the slag. At this portion of the furnace, and to lessen such eating away, a more silicious slag may be used, while a slag of the ordinary composition can be taken for the ends. Also, if a crust at one end of the furnace needs the fusing effect of a basic slag, charges of that nature can be used. Practically the campaigns of these furnaces are of indefinite length, being only terminated by the lack of ore.

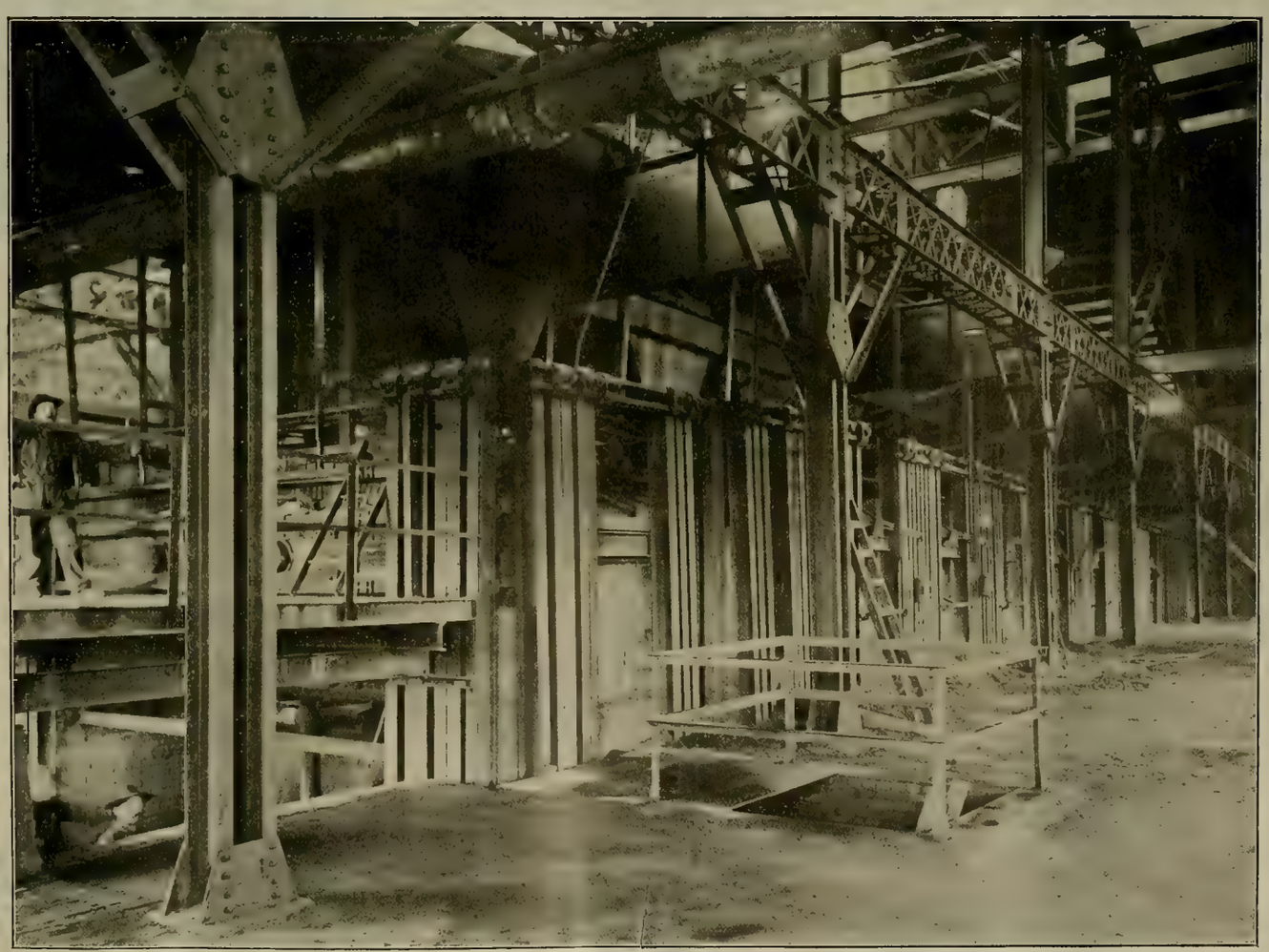
Blast Furnace, While Charging.

It is the custom of the Anaconda works to screen all their first-class ore through ⅜ in., the fine material being made into briquettes together with all the flue-dust of the plant and slimes from the settling-ponds, this last product assaying 2.5 to 5% copper. These products are made up into briquettes, being pugged and then put through an end-cut screw brick-machine at the rate of 840 tons daily. It is not attempted to dry these briquettes; they are charged to the furnace in a plastic condition. So well is the system arranged that there is no handling in the operation of briquetting. There is a string of 36 overhead hoppers each capable of holding 2,000 lb. of briquettes. Eighteen of these can be drawn off into a train of 18 charge-cars. These hoppers, or compartments, have hinged drop-bottom doors, all, or any, of which can be dropped by the movement of a lever. Thus, when the cars are set under them, they may be charged with a single movement. In the older practice of this particular plant a force of eight men was needed to prepare and dry 100 to 125 tons of briquettes. Now, with the same force, 840 tons can be turned out daily.

THE mining methods at present used in the Portland mine at Cripple Creek, Colorado, have been developed from years of experience with veins of the Cripple Creek class, and are considered as representing the best practice. The ore is first broken as coarse as possible, and the coarser waste sorted out and left in the stopes. As there is not enough of this waste to completely fill the stopes, it is necessary to use large quantities of timber to support the ground. In the past, such methods as sending all the rock from the stopes through the ore-houses, working the stopes without timber, etc., were tried and found to be more expensive than the methods at present used, and at the same time had a tendency to reduce the grade of the ore to a point lower than it would have been had proper care been used in eliminating the waste rock. The cause of this reduction in grade by allowing all the waste rock to go through with the ore is easily understood. As the rock passes from the stopes into tram-cars, into and out of skips, and at last into the ore-houses, more or less of the waste rock is broken into fines which it is impossible to eliminate. The caving system, as used in the soft iron mines, is entirely impractical because of the hardness of the rock, and the large amount of ore that is lost. The filling system, in which the broken ore is allowed to remain in the stopes until the level above is reached, and is then removed, is practical only where the veins are narrow.—From *Annual Report* of the Portland Gold Mining Company.



Blast Furnace, No. 5 and 6, with Settlers at Slag Floor, Washoe Smelter, Anaconda.



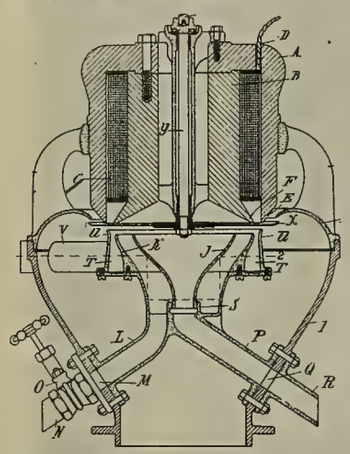
Reverberatory Furnace, Washoe Smelter, Anaconda, Montana.

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 13, 1906.

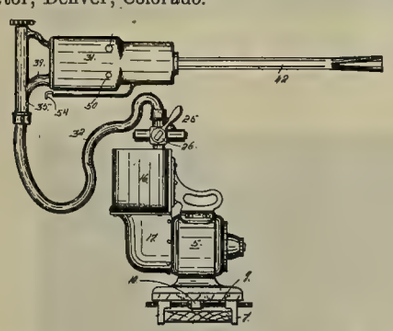
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MAGNETIC ORE-SEPARATOR.—No. 812,173; G. Grondal, Djursholm, Sweden.



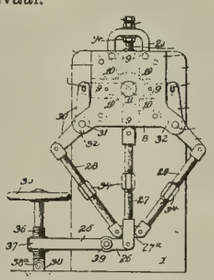
A magnetic separator for powdered ore suspended in water, comprising an upright cylindrical electromagnet having pole pieces directed downward in shape of concentric rings, beneath pole pieces a rapidly rotating disk mounted on a vertical shaft and beneath disk two annular vessels concentric to each other, inlet for fluid to outer vessel and adjustable discharge at bottom of inner vessel, space inside inner annular vessel being provided with outlet for fluid.

MEANS FOR OPERATING DRILLS.—No. 811,791; O. S. Proctor, Denver, Colorado.



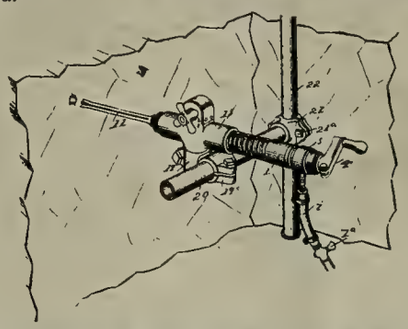
Combination of a motor-cylinder, piston therein, drill-cylinder piston constituting hammer, drilling-tool located forward of hammer and having longitudinal passage therethrough for delivering fluid to drill-hole, conduit between two cylinders, by-pass leading from drill-cylinder to point in front of drilling-tool, valve for controlling by-pass, valve mechanism for controlling passage of air between two cylinders, mechanism being constructed to allow air to pass freely from motor-cylinder to drill-cylinder during forward movement of motor-piston, while rarefaction of air in drill-cylinder is prevented during return movement of motor-piston, motor cylinder being supplied with air from atmosphere during reverse movement of its piston and adjustable means connected with drill-cylinder whereby air may be allowed to escape from conduit into atmosphere, or compelled to pass to drill-cylinder as desired.

APPARATUS FOR SHARPENING ROCK-DRILLING MACHINE BITS.—No. 812,570; J. A. G. Kirsten, Randfontein, Transvaal.



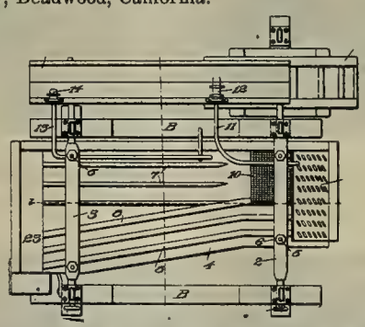
In apparatus for sharpening rock-drilling bits, main vertical plate, second vertical plate fixed thereto and having central aperture and vertical and horizontal guideways radiating from aperture, die-carriers in guideways, dies attached to carriers, a device for adjustably supporting top vertical die, levers pivoted to second plate and connected to horizontal die-carriers, lever pivoted to main plate and yieldingly connected with bottom vertical die-carrier and with levers operating horizontal die-carriers, and means for operating lever pivoted to main plate.

ROCK DRILL.—No. 812,375; C. J. Smith, Ottumwa, Iowa.



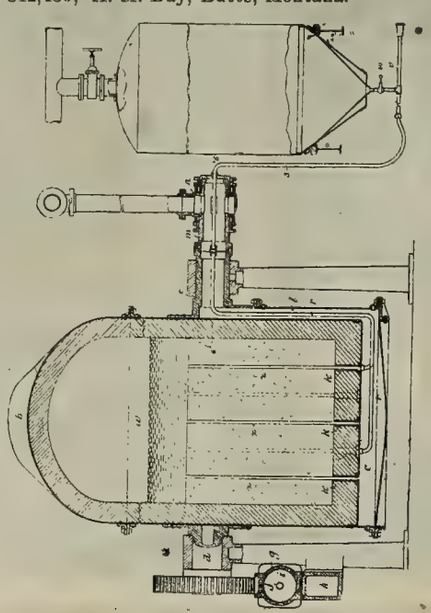
An apparatus of class described, comprising drill including casing and reciprocating hammer operable therein, drill casing having externally threaded portion, supporting casing having an internal bore for receiving drill casing, drill-casing-engaging member on supporting casing for engaging threaded portion of drill casing to lock same to supporting casing, means carried by drill casing whereby drill casing can be turned on longitudinal axis to feed same, drill casing and drill-casing-engaging member being so arranged as to permit drill to be automatically fed forward on its longitudinal axis at each forward impulse of the hammer.

GOLD-SAVING APPARATUS.—No. 812,474; O. H. Bagley, Deadwood, California.



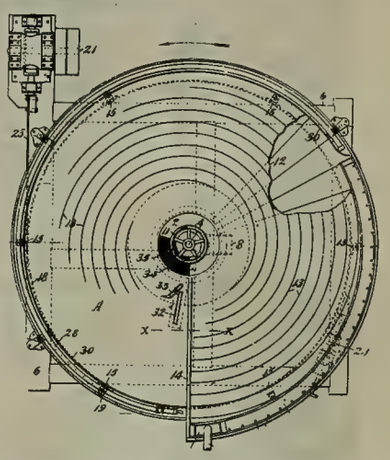
A gold-washer comprising table suitably mounted for reciprocatory movement, table having generally straight back portion with closed back and ends and opened at front, front edge of table made divergent toward rear of table, whereby latter has generally flared appearance from front to rear, series of riffles on surface of table extending approximately parallel with front divergent edge of table, means for delivering material onto head or narrower end of table, means for giving table longitudinal reciprocating movement, table having surface slightly higher at center than at either side, and means for adjusting transverse tilt of table.

APPARATUS FOR SMELTING AND CONVERTING ORES.—No. 812,186; A. M. Day, Butte, Montana.



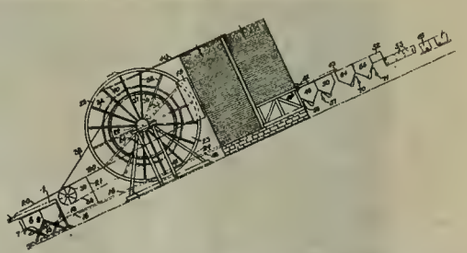
In apparatus for smelting and converting ores combination of smelting vessel provided with tuyeres and mounted on trunnions, one of which has a detachable extension forming therewith air supply connection to tuyeres, compressed-air-supply pipe provided with internally recessed sleeve in which trunnion extension is adapted to turn and through which it communicates with pipe, number of closed receptacles for holding fluent material connected at top with source of compressed air and having at bottom valve-controlled connections with auxiliary blast pipes which communicate with compressed-air supply and have flexible connections with trunnion extension, and pipes leading therefrom through associated trunnion to certain tuyeres and adapted to make tight joints with corresponding pipes in extension when it is attached to trunnion.

ORE CONCENTRATOR.—No. 812,520; J. W. Pinder, San Francisco, California.



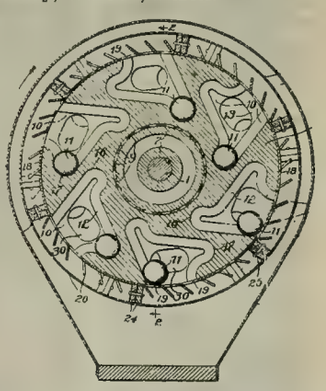
A concentrating-pan having concaved upper surface and mounted on central support, pan being essentially involute in outline, spiral riffles on pan and feed-box arranged around pan at the point farthest removed from central support, pan having separate discharges for values and worthless matter and means for giving pan an oscillatory movement.

APPARATUS FOR TREATING SLIMES, &C., FOR THE RECOVERY OF THE PRECIOUS METALS.—No. 812,418; C. Gluyas, Johannesburg, Transvaal.



In apparatus for treating metal-bearing material, elevating device comprising plurality of wheels, each provided with plurality of sets of elevating buckets, means for driving wheels, means for conveying material in succession to several sets of buckets, and aerating devices comprising superposed launders interposed in conveying means.

PULVERIZER.—No. 812,231; G. Raymond, Chicago, and J. H. Finlay, Warsaw, Illinois.



In pulverizing mill, combination with rotating drum, of pockets in drum, peripheral openings in pockets, tumbler balls confined within pockets, pockets being provided with inclines 15 and sockets 16, whereby balls are carried in pockets during upward part of their revolution and with raceways to guide motion of tumblers, cylindrical screen surrounding drum and rotating therewith, and scoops adapted to guide material to openings.

Stamp-Milling in Northern California.

Written for the MINING AND SCIENTIFIC PRESS by ALGERNON DEL MAR.

Those who have used triple or quadruple-discharge mortars have no doubt ascertained the fact that while a big tonnage is obtainable the extraction of the precious metals suffers in proportion. To obtain a high extraction and at the same time put through a maximum amount of ore is the object sought. Just where the line should be drawn will depend upon the treatment of tailing and the ore reserves of the mine.

The tests here recorded may be of use to those who have similar mills, a number of which have been discarded for five-stamp batteries, and with reason; but it may be possible that in some cases this substitution has been unnecessary and good results could have been obtained by regulating the conditions to suit a particular ore.

A close study of the physical and chemical nature of the ore may at once give hints for its proper treatment; in any event, the series of tests to be described ought to lead to a better understanding of what features to avoid and which to encourage in the process of reduction.

The ore in the Southern Cross mine of the Edel Mining Company in Butte county, California, is a pure quartz, very friable and easily slimed in a hand mortar. It contains about one per cent of sulphides, both iron and copper pyrite and galena, and on pulverizing the tendency is to make slime. These facts at once indicate the necessity for a coarse screen and medium discharge, or a fine screen with a low discharge, with a short drop in either case. The screen must be one that will not clog easily, allowing the crushed ore to escape without delay. In any case, for test-runs it is most important that the crushing be steady and the tailing of the fineness indicated by the screen, conditions which are unattainable if such an uncertain factor as clogging were introduced.

A moderate discharge is best with a coarse screen so that the heavy particles can be held back longer and the fine gold allowed an opportunity of amalgamating inside the mortar; while the low discharge and fine screen produce about the same percentage of tailing passing a given mesh, but tend to release the particles as soon as broken fine enough to go through the screen. Supposing the percentage of extraction to be the same in both cases, the choice would be with the one giving the greatest tonnage, this to be determined by experiment.

The Edel mill is composed of two batteries of two stamps each, in quadruple-discharge mortars. The stamps weigh about 950 lb. and drop 5½ in. 115 times per minute. Whenever the drop has increased (by the wear of the die) an inch, it is set back to 5½, thus permitting a variation of one inch. To make comparisons of tonnages, etc., as accurate as circumstances will allow, the speed was varied so as to produce the same energy at the beginning and end of tests. Only two factors, the drop and weight of stamp, could be taken into account, the former accurately, the latter approximately. As each individual machine is operated by its own water-motor, the speed of stamps was changed at will without interfering with the rock-breaker, electric-light generator or concentrators.

The battery plates are four feet wide and 19 ft. long, thus allowing 38 sq. ft. of amalgamating surface to each stamp and, with a duty of four tons per stamp, 9½ sq. ft. per ton per day, which is ample for all purposes. The pulp, after going through a mercury tap, discharges on Frue vanners, one for each battery.

It is possible with a battery of this type to obtain a duty of over six tons, but unless followed by a cyanide plant, the experiment is apt to be a financial failure, and, where it is not necessary to add the expense of cyanide treatment, there is no reason why such a big capacity should be sought. The ore is no sooner crushed to the mesh of screen than it is discharged on the plates; therefore, the amalgamating ability of a stamp battery—its only meritorious feature—is nullified or ignored. As far as crushing to a desired mesh is concerned, the stamp-mill is not an economical machine, but its usefulness as an amalgamator cannot be surpassed. Aside from the influences of inside plates — and consequent inside amalgamation—including the factors of discharge, height, drop, weight and speed, this high tonnage swamps the plates and delivers to the vanners more material than they can concentrate effectively.

To start with, three sides of the mortars were closed, leaving only the front screens to do duty. The screen-frame opening being only 19 in. long horizontally, it compares favorably with a standard five-stamp battery. Copper plates were attached to the three closed sides, but they scoured so that a protecting screen was needed. For this purpose, a half-inch mesh steel-wire screen was used, and it served the purpose very well. The object of inside plates was to endeavor to catch the fine gold before it could leave the influences of finely divided quicksilver and the successive splashes of the pulp inside the mortar. Two-splash plates and a lip-plate completed the amalgamating devices.

After starting a new run the inside and splash plates were kept stiff for a couple of days and then allowed to harden, the splash-plates being brushed only when stained or not completely amalgamated all over. The battery plates were kept fairly stiff, but always soft enough to brush up and rubber off the amalgam; but were never soft enough to run. No scraping tools should ever be permitted on silvered plates nor should they be scratched in any way by walking over them or throwing screens or other articles upon them. No chemicals of any sort were used, not even a harmless wash of soap and water. Proper rubbing at the right time and the right amount will keep most plates in good condition, but rubbing without any specific purpose will do more harm than good.

The battery plates were brushed twice a day; at midnight, when the plates were simply cleaned and any loose amalgam taken off, and at midday, when the accumulated amalgam was rubbed up and taken care of. The noon clean-up occupied about 20 minutes per battery, while the midnight one took about half that time, thus losing half an hour per day on each battery.

After his noon dinner, the amalgamator hung up a battery, turned off the water, hosed the plates and sprinkled mercury according to the state of the amalgam. This was well rubbed in with a whisk broom, softening the amalgam so that it could be easily moved; it was then collected at the center of the plates by using the rubber. This was done lightly so as not to rob the plates completely, but leaving sufficient amalgam as a groundwork, for not only has gold a greater affinity for amalgam than mercury alone, but plates left without protection are apt to become hard and spotty. This amalgam being taken up in the scoop, the plates were brushed up toward the head with a whisk broom held with the straw ends away from the operator. Then the plates were brushed lightly horizontally so as to present an even, fine grain, with no lumps. The hose was now turned on and any loose amalgam escaping was washed into a tray previously inserted in the box at the bottom of the tables. I have known where this expedient saved half an ounce or more per day, but the mill was running on $40 ore and the plates had to be brushed every four hours.

The 19 ft. of plates before-mentioned are made up of five plates four feet each, one foot being taken up for overlap. There are no screws used in the plates at all, each plate overlaps the next below and is held down solely by side strips which are gained to fit the plates accurately, therefore preventing any plate from slipping. Every millman will appreciate the absence of screws when cleaning up. I believe the idea is due to Mr. Emile R Abadie, formerly superintendent of the North Star mines, at Grass Valley.

Samples were taken every hour from the feeders and tailing coming from concentrator, quicksilver being fed at the same time. Determinations of fineness of crushing were made on samples from the accumulated tailing, for the tailing running to waste varied so much that unless taken over an extended period the samples were useless. The amount crushed per stamp per hour was determined twice daily by noting the time required to fill a 20-gal. tub, allowing to settle, decanting the clear water, drying and weighing. Only two sizes of screens were used, for while sizing to many meshes may be of technical interest to a few academically inclined, it is of little practical use.

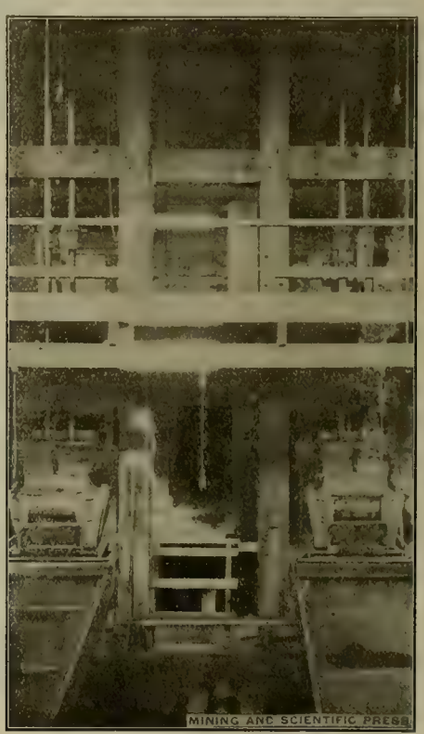
All abnormal determinations were thrown out. On the whole, the results, for a given discharge and drop, were consistent. With the needle-punched Russia-iron screens the results varied as much as 50%, while with the wire they often agreed within half of one per cent.

On account of the excessive clogging, and consequent variation in results, the needle-punched screens of thick iron were discarded and the choice then lay between a wire screen or a needle-punched tin screen or, what amounts to the same as the latter, a blued steel screen, both being of thin iron or steel. These are the only freely discharging screens known to me, except for coarse meshes, when a slotted screen does good work. The wire screen selected was a double-crimped No. 6 mesh steel wire, which seldom clogged while the tin screens often did, especially the finer meshes. The ratio of the times necessary to scrape the wire as compared with the tin screens (blued steel included) of the same mesh would be about one to five, so that, on the whole, the wire screens are better for testing purposes, where uniform conditions must be maintained.

If it is desired to maintain a certain discharge,

Quadruple Discharge Mortar.

Edel Mill.



Interior View of Mill.

there is no reason why a screen should be used that will change that discharge an inch or so by its clogging; and as the discharge is the most important factor of all, the moral is to find out by experiment the best screen (not necessarily the cheapest) and the best discharge, and stick to them as long as that particular ore remains the same physically and chemically. The following tests extended over a period of about six days each:

TESTS.

No.	Screen.	Size of openings—inch	Discharge—inches	Per cent through 60-mesh brass wire	Per cent through 40-mesh brass wire	Assay of tailing	Tonnage per stamp per 1b.—hour
1	No. 6 wire	0.027	6	64	88	0.90	300
2	No. 4 blued steel	0.035	6	70	88	1.20	270
3	No. 6 wire	0.027	5¼	58	81	trace	320
4	No. 0 tin	0.024	5½	91	94	0 90	131
5	No. 4 blued steel	0.035	5¼	64	88	trace	280
6	No. 6 wire	0.027	4½	45	86	1.45	340
7	No. 0 tin	0.024	4¼	70	85	1 85	146
8	No. 6 wire	0.027	3½	33	79	1.45	420
9	No. 0 tin	0.024	3½	50	80	0.94	360

The results show that not only does the wire screen give the highest tonnage, but also a better extraction, except in the case of a 3½-in. discharge where the tin screen of fine mesh gives a better result than the wire screen of coarse mesh, but not as against the wire screen with a higher discharge (Test No. 3), where the tonnage is higher and extraction better. The ore averaged about the same for the nine tests, except in the case of No. 5, which was of much lower grade; but even in this case, the tonnage being less than No. 3, the result would be discarded.

To ascertain where the gold escaped, in some of the runs the tailing was separated into fine and coarse, with the following results:

First test tailing assayed	$1.24
Passing 60-mesh	1.24
Not passing 60-mesh	Trace

To make sure of this point, another series was run as follows:

Passing 60-mesh	$4.36
Passing 60-mesh after washing off slime and heavy particles	0.30
Slime washed off	6.18
Coarse material	Trace

This proves the point conclusively that the values were being carried off in the fine material, therefore a screen must be used that will discharge freely and the discharge kept at such a height that the gold will have time to amalgamate, without sliming either the gold or the sulphides.

This also answers the query of one of your correspondents in respect to sliming ore as carried out in Western Australia. The answer is that each particular ore requires a particular treatment. In this case, what would be the use of sliming that portion of the ore that contains only a trace? The object in this case is to prevent sliming; for the more the slime, the more gold escapes in the tailing. It is surely more economical in this case to crush to 0.027 in., say 25-mesh, and concentrate, than to slime the whole material and cyanide afterward.

By plotting the results in terms of tonnage and screening, two curious facts are observed: first, that while the fineness of crushing varies directly as the discharge, the tonnage takes an abnormal jump between 4½ and 3½ in. This is, no doubt, due to two factors, the specific gravity of the ore and the shape and size of the mortar at the screen-opening. The conclusion is that on some ores at least a quadruple-discharge battery can be arranged to do good work, both as to extraction and tonnage. The most important factors to be considered and determined by experiment are the height of discharge and the size and character of screen.

SURFACE AREA OF SCREENS.—In view of the fact that the efficiency of the subsequent metallurgical processes depends largely upon the surface areas of material exposed by crushing, it may be noted that, given equal weights of similarly shaped particles, the relative total surface areas are inversely proportional to the average diameters of the particles in each case. For instance, sixty-four 1-in. cubes expose four times the surface area of one 4-in. cube. Hence, simple ratios between relative screening apertures facilitate comparisons of surface areas. According to Rittinger, the work done in crushing is proportional to the reduction in diameter or the increase in surface exposed.—W. A. Caldecott.

THE Mexican International Railroad has handed over to the Mexican Coal & Coke Co. its coal mines at Sabinas, receiving in return the railroad which the coal company has been operating from Baroteran, on the main line of the International, to Muzquiz, where the coal company has mines. The coal company's railroad is said to have been valued at $400,000 gold. With the exchange there is understood to be a stipulation that the coal company will furnish coal to all the divisions of the national lines of Mexico at a fair price. The coal output is expected to increase under the new management. Meanwhile some of the Mexican railroad divisions are making experiments with crude oil in their engines.

Handling Men Underground.

Written for the MINING AND SCIENTIFIC PRESS by R. B. NICKERSON.

The man most closely identified with the handling of large crews of men underground is the mine foreman. He must, necessarily, be a master in the art of mining and a man of strong and vigorous constitution, to stand the heavy mental and physical strain, for upon his shoulders rests, primarily, the responsibility of the safety of the crew and the profitable extraction of the immense daily tonnage of ore required by a modern crushing plant. Of these mine foremen, those who have made the greatest success are of two distinct types, and their methods of handling crews are radically different and distinctive. The first, we will say, is of the aggressive, self-assertive, dominant type. He rules his men with an iron hand. He is very hard to please and is seldom satisfied with the work done, and the slightest infraction of his strict rules calls for instant dismissal. He is close-mouthed and secretive; forms no friendships, trusts no one. He sees to it, personally, that every man under his charge is working hard; he judges a man not by what he accomplishes, but by what he sees him do. He favors the practice of 'rushing,' that is, putting a Cornish crew against an Irish crew, or an American gang against an Italian, in the same stopes, but in opposition shifts, and then counting the cars on them. He has no regular time for making his trips through the mine. He may appear in any part of the workings at any moment, and he expects to find everyone hard at work. He makes 'sneaks' on the men and watches them when they least suspect it. He is a man of few words and quick decision. It is either yes or no with him. He neither asks nor expects an opinion regarding any of the work. It must all be done his way. Even his shift-bosses have but very little license. If it were possible, he would direct the pitching of every hole and the driving of every wedge. He makes his mind up himself how any piece of work should be done, and gives his orders accordingly. "If you're a boss, be a boss," is his motto. In a word, he dominates the mine with his own personality. Full of nervous, tireless energy, he works his crew to the breaking strain all the time. He has no preference for married men; he thinks, and says, that if a man works six months in a mine it is long enough. Frequently he changes men who are partners and getting along well together; also he changes parts of shifts who are working in some particular stope to another stope, and for no apparent reason. In fact, he adopts a policy of constantly harassing and surprising his crew. They never know what is coming next. Mines handled in this way are the ones where men are constantly coming and going, and where the monthly payroll has frequently more than twice the number of names than are actually at work in the mine.

The other type of mine foreman is in all ways radically different from the type just described. Of course, they both take their general orders from the superintendent, but he seldom interferes with the detail work. The superintendent, of course, is the 'main push' when it comes to any show-down regarding any part of the mine or work, but he seldom interferes with his foreman, after once giving him his general orders. This second type, so to speak, of mine foreman is quiet, genial, courteous and pleasant in all his dealings with his men. There is nothing bombastic about him. If he thinks a man is trying to do his task, he makes allowances for him and overlooks a good deal, and tries to make a good workman out of inferior material. He seldom 'fires' a man, but is very careful whom he puts on, sizing up an applicant from every point of view, as to his ability, experience, character, etc. He trusts his men and makes friendships that last a life-time. He judges a man's work not by what he sees him do, but by what he accomplishes, and the showing he makes. He is strictly opposed to the practice of 'rushing' and tries to encourage friendly feeling among his crew. He has his regular hours for making his trips through the mine and his men always know when to expect him. He never makes 'sneaks' or covertly watches them; he seldom starts an important piece of work without first calling a consultation of the shift-boss, timberman and some of the first-hand men who are to work there. The matter is fully discussed, in all its details, and a plan formed and agreed upon, in which all express their views. This man thinks "two heads are better than one, even if they are both mutton-heads." He has a decided preference for married men. He seldom changes men who are working partners, or changes parts of a shift from one stope to another. He likes steady men and it hurts him when a good man quits. Mines handled in this way are the ones whose men work till they are old and gray, raise families around, and the sons follow in the footsteps of their fathers.

Those are the two general types of mine foremen, handling the men who are taking out, mostly from immense depths, the great bulk of the world's supply of gold. Both are sincere and earnest. Both are successful and each is straining every nerve and fiber in him to take out the ore in the best and cheapest way possible consistent with good mining. Their ways are radically different, but they are both faithfully striving to accomplish the same end.

To Those That Use Powder.

The following cautions to miners appear in the last Annual Report of the Inspector of Mines, Idaho:

Don't start to drill in a new face until you have thoroughly satisfied yourself that there are no missed holes or unexploded pieces of powder left in the old butts or cut-off holes. If such are found, re-prime and shoot them before starting in to drill, as a slip may connect with the charge that will transmit a sympathetic concussion from the drill, especially if a machine is being employed that may explode a charge while drilling.

Don't depend entirely on reports. It often happens that the upper part of a charge will explode and the lower part remain alive and unexploded without going off.

Don't be in too big a hurry to go back to a burnt hole or 'stinker,' or to re-prime a missed hole, for it is safer to re-prime within an hour, say, than to work over a hole that has missed fire for a half shift, as missed holes will remain apparently dead for several hours without any sign of life, and then, unexpectedly go off. Several cases of this kind have occurred in the State recently with disastrous results.

Don't use any kind of metal tamping bar or tap a wooden one with a hammer when loading.

Don't carry a lighted candle together with powder or a capped fuse in the same hand.

Don't keep caps and fuse in the same place with powder.

Don't store powder in the same room with oils or other inflammable materials.

Don't thaw or keep powder in a blacksmith shop or a dwelling.

Don't jab too hard with a wooden tamping bar, in case a piece of powder fitchers or sticks half way in a hole, when loading, and you can not push it home gently. Never mind your reputation as a loader. Let the hole spoil. If it should result in your losing your job you will have yourself left, anyway.

Don't carry powder about your person to soften it, or attempt to thaw it in the flame of a candle, or crimp a cap with your teeth, or 'break' a stick in two. Cut it, no matter how dull your knife is, and if you haven't a knife, go and get one.

Don't jab a pick into a muck pile in the manner of striking a drill with a double hand hammer. You are likely to hit a stray piece of powder that will explode and blow your eyes out. Three such accidents have happened in Idaho during 1905. Use your pick to work the stuff down with more of a raking motion. It is safer, and just as effective.

Don't take a naked light into any warm storage place for powder or sub-magazine, or hang a candle over an open box of powder or scatter particles of powder in making a hole for a primer where they are likely to strike a candle flame.

Don't carry loose powder in your arm. Use a small canvas sack which you can swing over your shoulder with a rope loop.

Old powder is dangerous to handle in many ways and hard to explode. Demand fresh powder and strong caps. By practicing the above rules and using ordinary care, you will experience little trouble in handling powder.

HUNTINGTON-HEBERLEIN PROCESS.—An important improvement in the metallurgy of lead has been effected by the introduction of this which consists in heating a mixture of galena and lime at 700°C., then cooling to about 500°C. and passing a current of air through the mass, when sulphur dioxide is evolved. The process is continuous, the atmospheric oxygen interacting with the ore so long as any sulphur is present. In the Bradford-Carmichael process gypsum or anhydrite takes the place of lime, either of these minerals in the form of a sludge being intimately mixed with the lead ores and the dried mixture being subsequently heated in a stream of air. The issuing gases, which contain about 10% sulphur dioxide, may be utilized in the production of sulphuric acid. Two alternative explanations are given of the former of these processes, the first being that the lime becomes oxidized to calcium peroxide at 700°C. and that this compound is decomposed at 500°, the oxygen set free oxidizing the lead sulphide to lead sulphate. This sulphate then reacts with more sulphide yielding lead oxide and sulphur dioxide. The second hypothesis is that the lime and galena interact to form lead oxide and calcium sulphite, the latter compound then becoming oxidized to calcium sulphite or sulphate which partly becomes converted into calcium plumbite or plumbate while the remainder reacts with galena forming calcium sulphide and lead sulphate.—*Chemisches Central-Blatt.*

THERE are few if any countries in Europe that surpass Austria-Hungary in mineral wealth. Mining has been a favorite pursuit for centuries. Coal leads in production and value. There are more than 225,000 persons employed in mines. The annual output of rock salt is large, there being no less than 10,000 persons engaged in this industry. Of the other minerals, gold, silver and iron are produced in large quantities, the exports running into millions of dollars annually. Mineral springs are in abundance, the waters from which are sold in nearly every country in the world.

The Possibilities of the Tundra.

By Otto Halla.

Ever since the strike made by J. O. Brown on Little creek, the tundra at Nome has commanded attention as a possible big producer of gold; since then the fabulous find made on the Portland Bench has convinced the most pessimistic prospectors and miners that the tundra offers better prospects than any creek or hillside in the Nome district.

Sixteen men were working on the Portland Bench for 60 days and they have made a clean-up of $720,000. It cost them about 2% of this yield to work the ground. During the summer months of 1905, seven miles southwest from the Portland Bench a new strike was made on Jess creek, the claim finally being bought by Lane & French for $125,000, who expect to take out of it this coming winter about $500,000. These strikes are facts which cannot be disputed; the question is now: What likelihood is there of finding more ground like it, and what caused deposits of gold of such richness to be accumulated in these spots?

There is, in the immediate vicinity of Nome, an area of about 100 square miles of tundra ground (between Cape Nome and Cape Rodney) which is equally well situated and which is liable to have gold gravel in paying quantity or accumulated spots of a richness equal to that of the Portland Bench. The tundra is composed of strata of blue clay, interlined with layers of gold-bearing gravel, and all containing more or less gold; in some instances the gravel containing gold has a thickness of 20 ft. and more.

J. C. Brown's Claim, Little Creek, Nome.

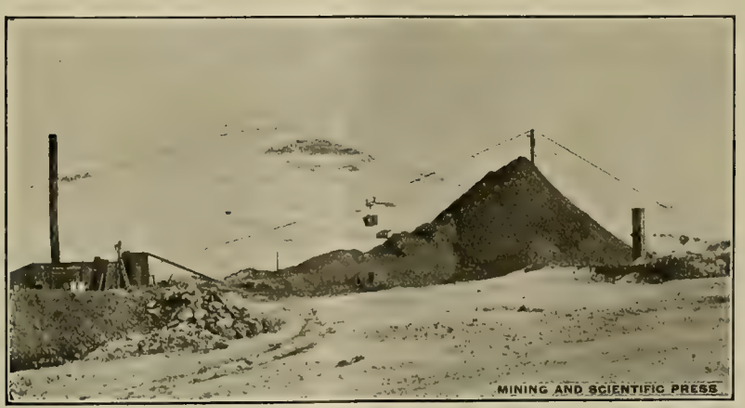
The sea undoubtedly has played an important part in the accumulation of the rich spots, as was demonstrated in the case of the beach deposits, which caused the big stampede to Nome in 1899. It is also certain that the Bering sea is receding every year, or else the mainland is rising. The debris washed down from the hills has a tendency to fill up the shallow water contiguous to the mainland. The sea, therefore, must have been at one time very close to the foothills, gradually receding until it reached the present level. The same agencies that have deposited gold on the present beach must have deposited gold on the ancient shore. It is claimed now that in the Portland Bench the gravels are beach pebbles; if this be so, the evidence is conclusive that the action of the sea has accumulated the gold deposits found at that particular locality.

Old and New Method of Mining.

Wherever a gold-bearing creek emptied into the sea, there at that particular spot is the place for a rich deposit, the sea constantly washing the gold and separating it from the debris. It is now conceded that there are several ancient beach streaks in the tundra of Nome; but on account of the foothills and the difference in the elevation of the bedrock, the regular channel has not yet been found or followed; but, undoubtedly, in the very near future the paystreaks in the tundra will be better understood, as a good deal of prospecting is being done at present and new finds are made constantly.

However, on account of the vast territory to be prospected, not much can be done in one or two years, for the present method, that of a steam-boiler and hand-windlass, is a very slow process. When drilling becomes the fashion, a greater territory can be tested in a short time; but this requires the investment of so much more capital, which has not come to the help of the Nome tundra prospector as yet.

The Snake River basin is especially favorably situated and is likely to have several gold-bearing beach-streaks, as the watershed of all the best gold producing creeks slopes toward it; but the area is so vast, that it will require a good deal of money to institute a systematic search.



Little Creek, Nome, Alaska, in the Winter of 1905.

According to L. Vogelstein & Co., of New York, the German consumption of foreign copper for the months of January to December, 1905, as compared with the same period of time for 1904 and 1903, was:

	1905. Tons.	1904. Tons.	1903. Tons.
Imports	109,159	116,670	88,792
Exports	12 351	9 341	9,999
Consumption	96,808	107,329	78,793

Thorium.

From its discovery in 1828 until quite recently, thorium belonged to that class of the rare metals whose occurrence is of greater importance to chemical speculation than to industry; but the invention of the gas-burner mantel and the experimental determination of the illuminative quality of its oxide removed it at once from this class into that of products that are indispensable. It has been admitted that the salvation of gas as an illuminant in competition with other lighting methods lay in the invention of the gas mantel, which is made by saturating a network of cotton with a solution of the combined nitrates, oxides, or bromides of thorium and other metals of the same serial group. Incineration converts the metal into its oxide, and under these conditions thorium has established its superiority over related elements, not only in virtue of higher illuminating power—increased by the addition of small amounts of uranium and cerium oxide—but also by the preservation of a serviceable minimum of stability after ignition. The metal is of fairly wide range; in thorite and orangite it occurs in Norway—the land of its original discovery—and in the Champlain iron region of northern New York as urano-thorite. The singularly delicate and prolonged manipulation necessary to the exact determination of the metal, and even in cases to its recognition, is a stumbling block in the way of the prospector, and not infrequently leads to confusion, as recently in Ceylon, where a supposed deposit of pitch-blende turned out on analysis to be a new mineral containing 76.32% of thorium oxide. The best known, and commercially the most important, occurrence is the monazite which is abundantly distributed as a minor constituent of the gneissoid rocks of Brazil and North Carolina. The high specific gravity of the cerium group of metals renders them peculiarly susceptible to mechanical concentration after the disintegration of the containing mineral and monazite sands, which are due to selective marine action, and cover large tracts in Brazil, have hitherto constituted the chief source of supply. Monazite, which in its essential character is an anhydrous phosphate of the rare earths of the cerium group, contains varying quantities of thorium, and it is to this that its commercial value is referable. The Brazilian production, in correspondence with the demand, has shown remarkable expansion during the past four years, the figures being as follows: In 1902, 811 metric tons of the value of $81,115; 1903, 3,299 tons valued at $355,876; and 1904, 4,860 metric tons valued at $522,360. Its export to Europe, where the control of the market has lately been in the hands of a German syndicate, was originally, it is believed, in the form of ballast, but the recognition of its value was not long delayed, and prospecting has enlarged the bounds of its known occurrence. To the opening up of these further deposits, and to those in the northern half of the American continent, the consumer is at present looking for relief from the artificial conditions which at present exist in connection with the commercial control of the metal. During the last four years prices have been gradually raised in accordance with the growing demand, until quite recently they stood at London as high as 53s. per km. less 7% and other small rebates. Suddenly the price has dropped to 27s., and it is considered that competition is in course of maturing on a scale which makes the syndicate's control seriously concerned as to its present condition, and desirous, if possible, of forestalling it. Both in Brazil itself and the Carolinas arrangements are in progress which are expected to give a substantial stimulus to the production of the metal, while the high range of prices has naturally imparted a considerable impetus to prospecting both in Australia and Ceylon.

Operation of Rock-Drills.—I believe in a man working his machines as near together as possible, preferably on adjoining benches, if the ground admits, whether he is bringing the benches down or working back from the stope bottom. The latter system is, of course, inapplicable in steep stopes. In such safety requires that the benches be followed down, but in a stope of 35° dip or less my preference is to open out the bottom from the winze, undercutting as far as the first box hole on each side, and gradually forming the whole of each face into benches, extending from winze to box hole; then starting at the bottom to work back to the last bench, return to the bottom, break out the dead end and work, re-treating again, and so on. It is evident that drills should be kept on adjoining benches to maintain the sequence; no man should blast his own front and back holes bored on the same shift, and where a bench does not break properly, it must be put in shape before the work proceeds. With this system the ground always breaks away from the machine and toward the stope boxes, thus materially aiding in shovelling; the benches are never so buried with broken rock as when they are carried down and the leader is thus more easily followed; there is less tendency to bore holes into the hanging wall, with the consequent increase in waste, and the machines lifted from the bench they have drilled today are safe on the one they must drill on tomorrow, and, if time admits, may be rigged up and left standing for the next shift, thus saving time. The system lends itself to the shaping of pillars on the lower side, and by starting at the right distance above the pillar and benching down to it, the face of the stope, when the pillar is holed, is in such shape that the benches above and below readily merge into each other. Finally, the system requires less room. You may work four machines to the best advantage on a 100 ft. face if they break ground properly.—Wager Bradford in *Jour. Chem., Met. & Min. Soc. of S. A.*

Building a Concrete Tank.

About a mine or mill it is often desirable to build a water tank. Ordinarily they are made of lumber, and, although answering the purpose for which they were constructed, often leak and are otherwise unsatisfactory despite the pains taken in their making. The following suggestions have been made by John W. Ferris, of San Francisco, on the construction of a concrete tank, which may be of use to those contemplating the building of a small tank for permanent use. The accompanying sketches will aid in an understanding of the description:

Level down the ground where the tank is to stand, and if it is not firm ram it thoroughly. Drive a short stake as a center stake. Take a piece of batten 6 ft. 6 in. long, and 3 in. from each end enter a spike; drive one of these into the stake that was driven into the ground and let the other project an inch or so; then with a spike that is driven into the stake as a center, mark out a circle which will be 12 ft. in diameter. Take 18 stakes of 2 by 4-in. pine, 4 ft. long, pointed at one end; drive these about 2 ft. apart with one of their 2-in. faces to the circle marked on the ground, taking care to have them all plumb. Round the bottom and outside of this circle of stakes nail a strip of board ½ in. by 6 in.; this circular enclosure, 12 ft. 8 in. in diameter, is to be filled with concrete thoroughly tamped, for the bottom of the trough.

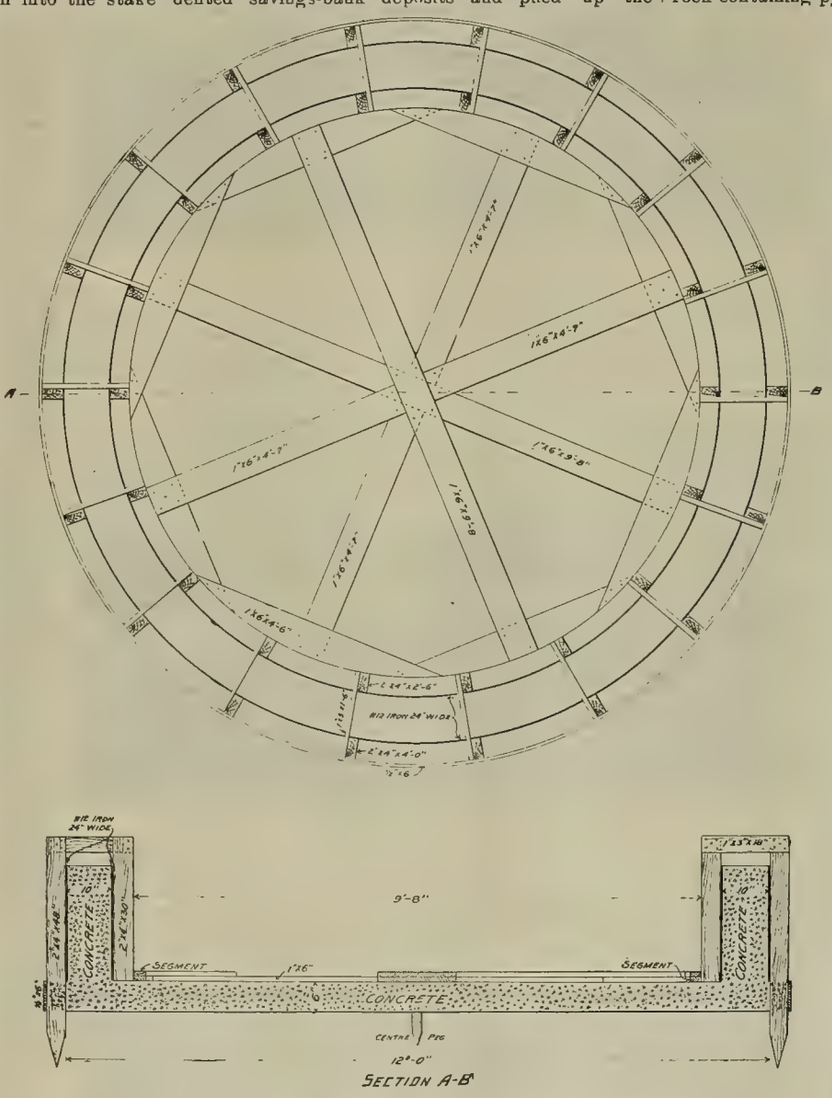
Take eight lengths of 1 by 6-in. fence board, 4 ft. 6 in. long, and the batten that was used to strike the 12-ft. circle, set the spikes 4 ft. 10 in. apart, and mark off the lengths of fence board into segments of circles.

Lay these segments down in a circle 14 in. inside the inner edge of the stakes that were set in the ground; let the segments overlay their ends 6 or 8 in. and nail them together, then take lengths of fence board and set across the circle, nailing their ends at the middle of the segments, to hold them securely in place.

Take 18 pieces of 2 by 4-in. pine, 2 ft. 6 in. long, and 18 pieces of 1 by 3-in. batten, 18 in. long; set up one of the pieces of 2 by 4 opposite each 2 by 4 stake, and nail the batten across at top to hold the 2 by 4s 10 in. apart; the segments serve to hold the upright at the bottom.

Take half-inch boards and tack to the 2 by 4s to make the forms for the wall of the tank. A much better looking job can be made by using sheet-iron instead of the boards one length, 2 ft. wide and 36 ft. long for the inside and 2 ft. wide and 38 ft. long for the outside.

Nail some boards together to make a box without any bottom, measuring (inside) 3 ft. square and 18 in. deep; this will hold half a cubic yard. Fill this with gravel; lift off the box and spread the gravel out in a layer 6 in. thick; over it spread three-quarters of a barrel or three sacks of portland cement. Turn this not less than twice before adding any water. Sprinkle over it 15 gal. of water and turn twice more. Then between the sheet-irons fill in the concrete in 6-in. layers, tamping each layer thoroughly, till water shows on top of the concrete.



Construction of a Concrete Water Tank.

There will be needed altogether 5 cu. yd. of concrete; for this any clean creek gravel will serve, at the rate of 1 cu. yd. of gravel to each barrel and a half of cement, or if the cement is in sacks 1 cu. yd. of gravel to six sacks of cement.

The tank will hold level full a liberal 1,200 gal. I have tanks made this way that are five or six years old and have never leaked. The round tank is better looking than a square one, and is not so likely to be broken. The cost of material will be:

For hauling gravel, say	$ 5
For 7½ bbl. cement	15
For lumber for forms	5
Total	$25

Or if the sheet-iron lining for forms be used add $20 extra.

STEEL CONSTRUCTION.—The recent computation showing that 200,000 tons of structural steel will be required for buildings to be erected in New York the coming season, and for which detail plans have already been made, indicates how large a factor such operations are in the present prosperity of the iron trade. This tonnage represents projects on which contractors' bids have been asked, and that are expected to be carried out unless interrupted by financial or industrial developments calculated to check all business. It is entirely reasonable, in view of these figures, to look for the placing of 300,000 tons of structural steel for work in New York alone before the end of the year. The total placed in the year 1905 for use in New York City has been closely calculated, and is found to be somewhat above 200,000 tons. Structural steel sells at nearly twice the extreme low price touched in the nineties, and yet in comparison with many products now and with its own high records of boom times it is at a moderate level. Real estate is high, and securities, while high priced, are still attractive as compared with the returns of city buildings, based on present costs of labor, ground and materials. Instead of being a badge of industrial distress, as it was ten years ago, the present building movement results from an overflowing prosperity that has accumulated unprecedented savings-bank deposits and piled up the surplus of the wealthy beyond any dream of a decade ago. The new buildings of today are going up because the growth of the great cities of the country requires the tearing down of the old, to be re-placed by what is better and larger.—*Iron Age.*

VANADIUM.—This rare metal has come into prominence within the last four or five years, on account of the great increase in tensile strength, elasticity, and ductility it imparts to steel when added only to the extent of about 0 2 to 0 5%. Its most important ore is vanadinite or chlora-vanadate of lead. In the pure state it should contain 19 35% V_2O_5, but the ores actually used for the manufacture of ferro-vanadium generally only contain in the neighborhood of 10% V_2O_5. Such an ore is worth in London about 4s. to 5s. per kg. of V_2O_5 contents, assuming that it tests over 10%. The metal is found in quite a number of rare minerals, such as dechenite, vanadite, carnotite. etc. The ash obtained from anthracite, found at Yauli, in Peru, is said to contain as much as 25% of V_2O_5. A French company was to be started to exploit these deposits, but so far nothing has come of it. Vanadium ores are found in limited quantities in Spain, the Argentine Republic, Mexico, Sweden and the United States.—O. J. Steinhart, *Trans. Inst. M. & M.*

The Prospector.

Enquiries sent to this department are answered free of charge. If submitted by subscribers who are not in arrears The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question No assays are made.

The ore from Inyo county, California, marked T. W. P., is quartz with molybdenite. The yellow mineral is molybdite, the tri-oxide of molybdenum.

The ore from Oasis, Esmeralda county, Nevada, is mostly quartz, with clay and ferric iron. A few small crystals of wulfenite (lead molybdate) are also present. The accompanying rock, marked No. 2, is granite.

The rocks from Waldo, Or., marked 'C. S. B.' are: No. 1, serpentine; No. 2, granular quartz; No. 3, syenite; No. 4, syenite; No. 5, a syenitic or granitic rock containing pyrite and chalcopyrite (copper sulphide), and also principally pyrrhotite. No. 6 is calcium carbonate; No. 7, syenite; No. 8, norite.

The rock specimens from Yerington, Nev., are classified as follows: No. 1, quartz-porphyry. It often occurs in large masses, forming entire hills. No. 2 is a silicious dike rock, stained with iron oxide and copper carbonate. No. 3 is diorite-aphanite (a fine-grained black diorite). No. 4 is diorite. No. 5is an altered diorite, containing epidote, magnetite and pyrite (iron sulphide). No. 6 is mostly iron oxide, and is what is commonly called gossan. A shaft should be sunk on No. 6 to determine its character in depth.

The rocks from Hedley, B. C., are: No. 1 has the appearance of a silicified aplite. It is nearly all silica, with disseminated pyrite. No. 2 is somewhat decomposed. It is syenite. No. 3 is another silicified dike rock, similar to No. 1. No. 4 is similar, but contains more iron. No. 5 seemingly presents another phase of the same rock, while No. 6 seems to have come from a deeper part of the mine. It is not unlike the others in other respects. No. 7 may also be classed with the others. No. 8 is a fine, granular silica, with mispickel (arsenical iron sulphide). With the exception of No. 2, all of these rocks are evidently from the same district, and possibly from the same mass. They present various stages of alteration and variable amount of iron.

PITCHBLENDE, one of the ores of uranium, occurs, as a rule, in massive form, but occasionally is found in the crystallized condition, when it forms dark-brown translucent crystals. Its fracture is conchoidal to uneven, its hardness 5.5, while its specific gravity varies between 8 and 9.7. It, however, frequently occurs in altered form, and is partly or entirely changed by the effects of the atmosphere and moisture into the yellow hydrated oxide, whereby its specific gravity becomes lowered, and its color varied into canary-yellow or a somewhat darker reddish shade. Uraninite, when pure, is opaque, of a velvety-black or grayish appearance; has a submetallic, greasy, or pitch-like dull lustre, and gives a streak verging from brownish-black to grayish and olive-green. The metal uranium, or its carbide, has the peculiar capability of imparting desirable properties to iron and steel; imparts to glass a beautiful fluorescence of a greenish-yellow hue, and finds application in the manufacture of Welsbach mantels, being considered a welcome addition in cases to the thorium, cerium, and zerconium salts used.

SCREENS.—Screen aperture is of the first importance in describing any milling results, as it governs the size of the particles of crushed ore. It matters not what mesh screen is used, so long as we know *the size of the ores or apertures* in the screens, and, consequently, the maximum size of the ore particles issuing from any given screen. This is the precise information required, not alone in all comparisons of crushing results between various machines or mills, but also in that of chemical processes, where the relative fineness of the product submitted to solvents is of first importance.—P. Argall.

Mining Summary.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

LONDON, February 14.

People of limited perspective imagined that the general election was going to have an adverse influence on trade. Such has not been the case, however. The cherished duty of heckling candidates for Parliament was not all-absorbing. The business of the country went on notwithstanding, as shown by the volume of imports and exports; in fact, January proved to be a record month in foreign trading, each side of the balance sheet showing an increase of some 5¾ millions sterling over the corresponding month of 1905. We bought from foreigners goods and raw material to the value of close on 12% more than in January of last year, and we sold 25% additional to customers outside the United Kingdom. The increase in exports included iron, steel and machinery, these important items particularly participating in the boom.

In other directions old John Bull is bent resolutely on proving that if he lacks the suppleness of youth, he possesses other qualities of a nature to command respect. He has just launched the *Dreadnought*, the most powerful, the best protected and fastest battleship afloat. Her displacement is 18,000 tons of water. Steam will be obtained from 18 Babcock & Wilcox water-tube boilers. She is boastfully described as combining the daring of the American engineer, the careful construction in detail and finish of the British workman, and the scientific thought which marks the products of the German General Staff. But John Bull is not to be allowed to spend all his surplus cash on munitions of war. The company promoter has opened the new year with attractions expected to secure a share of the nation's available funds. Rubber properties have been, perhaps, the leading favorites, but mining has not been lost sight of. A promotion which appeals more to the speculator than the investor is the Foldal Copper & Sulphur Co., Ltd., formed with a capital of £350,000, in £1 shares, to exploit a group of mines in Norway, covering an area of about 3,000 acres. Timber is available and there is an abundant supply of water to be obtained from the river close to the mines. The Foldal mine had been worked for a great many years, for copper only, but was shut down when the metal fell to a figure which left no profit. Three hundred thousand tons of copper-bearing iron pyrite were said to have been extracted by the ancients from a lode which they proved for a length of 200 meters and to a depth of 180 meters. Latterly this mine was unwatered for examination by that well-known authority on copper mining, M. Robellaz, of Paris. This gentleman in his report considers the Foldal mines to be "obviously in the same formation" as Roros, 55 miles distant, which has been worked for over 1,000 meters on the dip. Conditionally on this assumption, M. Robellaz estimates that 2,160,000 tons will be extracted to a depth of only 780 meters. When fully equipped, the mine will be capable of putting out 120,000 tons for many years, yielding a profit, with copper at £55 per ton, of £41,200. Another engineer estimates the profit at £68,700, or 11s. net per ton, judging from "developments upon other properties in Norway." In his report he "expresses the opinion" that the ore contains 2.25% copper, with 47% sulphur, and is practically free from arsenic. M. Robellaz states that his interpretation of the results obtained in the ancient workings "leads one to estimate" the average width of the mineralized mass at 3.75 meters; and he puts the ore in sight at 270,000 tons. The estimated net value of this appears to be about £100,000, and the mine is expected to begin profitable work in about two years. Before this desirable position is attained a ropeway must be built for a length of about 25 miles, from the mines to the nearest railway station. For all these prospective advantages set forth the company is to pay £224,000, of which £29,000 is cash. It is thought that an additional sum of £62,000 will suffice for equipment, as the ore will receive no treatment at the mine.

A mining flotation of an entirely different category is the Anantapur Gold Field, Ltd., with a capital of £30,000, the whole of which, with the exception of a few hundred pounds for purchase of options for two years on the property, and for the expenses of forming the company, is available as working capital. The area covered by the property is 2,447 acres, in the Anantapur district, Madras. The managers are Messrs. John Taylor & Sons, who have had the mining blocks examined by Mr. Thomas Richards, superintendent of Nundydroog and other mines. Favorable surface indications and ancient workings of a striking and extensive nature are to be seen, similar to those which led to the opening up of the great mines in the Mysore district. Quartz veins occur principally in chloritic and argillaceous schists. There are at least two parallel reefs—'true fissure veins.' In the event of the options being exercised, £3,000 is to be paid for the entire property, plus one-fifth in fully-paid shares of the nominal capital of a new and larger company. The promoters are content with 5% of the profits available for dividends.

In the Mysore district, the Champion Reef mine yielded a profit for the last financial year of £467,583 on a capital of £260,000 in 2s. 6d. shares. A pause—it is believed a temporary one only—has occurred in the brilliant success of this company. The lode maintains its width, but the ore has become poor, although some improvement is noticeable in the last fortnightly report. The January return was 17,222 oz. gold; mill yield, 15.55 dwt.; tailing yield, 2.59 dwt. Until the developments show normal values again, the milling is to be reduced by 3,000 tons per month.

As a proof that serious mining is going on in West Africa, the Abosso yield for January is cited. The 30-stamp mill crushed 3,889 tons for 2,563 oz., and 983 oz. were obtained from cyanide treatment. The new reef averages 3 oz. 7 dwt. for a width of 32 in., but further exploration and development are required to determine its extent. The list of a dozen producing mines in this colony totals up a return of about 18,400 oz. for January. The exceedingly adverse climate, according to one authority, accounts for the dilatory progress in West African mining, while from another quarter the health of the particular camp referred to is said to be in a most satisfactory state.

The gloom in South African affairs has been accentuated during the past week by the flooding, in consequence of heavy rains, of the Rudd shaft on South Rose Deep, causing the death of 55 natives, and by the suicide of a leading speculator in the Kaffir market. The contradictory Geduld assay-values also increased the prevailing depression. With the retort courteous (see my last week's letter), 'Westrallianism' is the term applied by a delineator of this new phase in South African mining. For the moment, a somewhat more hopeful tone is perceptible in Kaffir circles. The January output of gold from the Transvaal—428,638 oz., against 431,594 oz. in December—is considered satisfactory in view of the Chinese holidays.

A highly satisfactory report has been received from the consulting engineers of Esperanza (Mexico). The actual ore reserves amount to 127,400 metric tons, estimated to yield a net profit of $5,261,000 United States currency, not including ore capable of being won from probable reserves. The possibility of developing ore on the west vein system north of the fault, which traverses the property from east to west, is a feature of the report. Quartz 6 ft. thick, assaying $19.80 per metric ton, has been struck in a drill-hole. From this point to the boundary line there is an extent of 1,500 ft. of practically unexplored territory on the west vein system. Recent discoveries continue to open up extremely rich ore.

Messrs. Pearse, Kingston & Browne also write us under date of February 9: During the past week considerable interest has been evinced in Siberian mining, which may be a re-action from the deadly dullness which has lately over-shadowed everything Russian. It has its justification, however, in the good work being done at the Spassky copper and Nerchinsk gold mines. The latter company has just reported the fact that at their Kluchi mine the manager has succeeded in keeping his mills running up to date, since he started them for winter work in the middle of November. The significance of this report is apparent when one remembers that the average temperature in eastern Siberia during the mid-winter months is –70° F. The Kluchi is the first quartz mine to be operated in eastern Siberia. The Cabinet, who have hitherto controlled by far the greater part of Russian mining operations, have preferred to confine their attention to placer mining. Hence the Nerchinsk Co. has been doing pioneer work, and this winter's run has naturally been of the nature of an experiment, at any rate so far as the reduction works are concerned. With the question of winter work satisfactorily settled, and a body of ore 150 ft. wide going $12 per ton, this company should have a good future before it. Several registrations of new Siberian companies have been recently made, among which are the Sesan Syndicate and the Siberian Proprietary. The latter proposes to acquire a group of mines in the Orenburg district, which has been favorably reported on by Messrs. John Taylor & Sons, and which, worked by tributers with primitive appliances, has yielded 50,000 oz. gold within the past six years. It would seem, therefore, that Russia is coming into favor as a mining field.

It seems to be the opinion of engineers who have had an opportunity of studying Egypt that the water difficulty (at least in Upper Egypt) has been greatly exaggerated. No wells have been sunk for centuries, and as wadies with a profusion of mimosas are quite common, there is a probability that a good supply of water could be obtained if it were searched for systematically.

The South African market has declined lately. Various reasons are alleged, but there can be little doubt that the question of Chinese labor has been an important factor. It was so persistently used as a party cry during the general election, and so many exaggerated statements were made on both sides, that it has taken on a much more serious aspect than the facts of the case warrant. The new Liberal government may do its utmost to limit or stop the importation of Chinese; but the effects of such a policy are not likely to be so disastrous as the Tory party has seen fit to depict for electioneering purposes. There is a fair supply of Kaffir labor available, now that the demoralizing effects of the Boer war are wearing off; and this, with the contracts which have already been taken for Chinese, should prevent the labor difficulty from becoming a serious menace.

West Africans have taken an upward turn after a long period of depression. A curious side-light on this market is afforded by the fact that Bibiani shares stood at £1 premium twelve months ago, when the mine had not reached the producing stage. Now that it is earning about £10,000 per month, the shares are down to par, and have been considerably below.

DENVER, February 28.

From time to time rumors have circulated of 'finds' of gold ore in the low hills bounding the Animas valley, between Rockwood and Durango. Mr. M. T. Chestnut, of St. Louis, in passing through Denver recently, stated that he had found pay-ore of considerable width and exhibited samples showing free gold. Assays of some of the picked ore returned $200 and $300 gold per ton. Mr. Chestnut states that the ore came from a dike that can be traced for several miles. His locations are within sight of, and about one-half mile distant from, Trimble Springs, a station on the Silverton branch of the Denver & Rio Grande Railroad. Several men are employed developing the find.

The owners of the Iron Mask mine at Red Cliff are planning to erect a power plant, electric zinc separators and other facilities required for increasing the marketable output of that property. The Grand Junction Smelting Co. is considering increasing the capacity of the Grand Junction plant. The company has secured a lease of the Percy Chester mine at Red Cliff.

The Colorado Power & Irrigation Co. is establishing the grade of its water-power ditch. The ultimate intention of the company is to install an electric plant and distribute power to Leadville and other places. The present plans contemplate generating, with water as a prime power, 5,000 to 10,000 h.p. The Animas Power & Water Co. has continued active construction all through the unusually severe weather of the San Juan winter. The central power station is located at Rockwood on the Animas river, the transformer station being near the Silver Lake office above Silverton. The current is now transmitted to the transformer station and the company is prepared to supply power up to its full capicity. The water supply is from Cascade creek; the average capacity of the present reservoir being 1,000,000 cu. ft.; quantity, about 72 second-feet; head, 1,000 ft. With the present installation, the plant is capable of delivering 5,000 h.p. at the transformer station. Generators doubling this capacity are now being installed at Rockwood. The available water supply with additional development makes it possible to generate and deliver 30,000 h.p. to the transformer station. A high voltage, probably 40,000 volts, will be carried on the main line and a lower voltage on the distributing lines. The company has outlined a generous policy in dealing with the public. It will extend lateral lines one-half mile and furnish transformers to customers. The flat meter-rate is from 0.56 to 0.72 cent per kilo-watt hour; contract rates being from $60 to $78 per horsepower per annum. The minimum rate is based on 500 h.p., the maximum rate on 100 h.p. consumption.

Throughout the State there is a widespread movement to locate and utilize all the available water for power purposes. A score or more of companies are planning to use acquired water rights, while individuals, associations and companies are equipping reconnaissance parties to cover all parts of the State and locate unoccupied streams and sites. Irrigation and power possibilities that have been overlooked will be very scarce when the sun goes down on 1906, and defective title locations will be tied up with endless litigation.

Cripple Creek has an installed steam-boiler capacity of about 25,000 h.p. on the mines and producing power for mining operations only. On account of the large number of smaller properties working only at intervals, it is difficult to arrive at the exact percentage of power in use. A calculation made in April, 1905, showed that about 85% of the rated boiler capacity was in constant use. With three electro-power companies in the field, Cripple Creek uses about two per cent of electric power in mining operations. However, there is a growing tendency among operators buying heavier compressors, to provide a belt-wheel, and to have the air and steam-cylinders reversed, which is an intimation to the vendors of electric power that they are ready to be converted.

When the Rio Grande Railroad was extended to Silverton, it was more of an experiment than to handle the then existing traffic. For some years after its construction it was not a serious matter, to the road, that its trains were stopped weeks and even months at a time by snowslides. Today the case is different. The growing activity in the mines, calling for large quantities of machinery, building material and provisions, has during the past season taxed the road to its utmost capacity. The writer counted seven engines at one time shunting freight cars in the Rio Grande yards at Silverton last fall. Four 'double-header' incoming freights was a common daily occurrence. Notwithstanding the large number of engines and cars in service, the early snows caught Silverton a good many cars short, and when delivery was made the upper country was snowed in. Now the yards are full of freight that cannot be delivered until traffic is resumed above Silverton.

The Gold Prince mines have 67 carloads of freight in the yards.

It is reported that Silverton is to have another outlet by rail—that the Rio Grande is to extend its Creede branch to that point. What San Juan county and country needs most is a line that will give daily communication between mines and local supply points—some method that will go under or over or around the inevitable snowslide, and deliver the goods. An aerial ropeway, as now constructed, has its limitations. There is an opportunity for some engineer to gain renown and revenue by devising and building a system that will meet the conditions, here and elsewhere.

Until this is done there will always be difficulty in keeping a full force of men on the mines in winter and owners will continue to shut down early in the season rather than tie up thousands of dollars in supplies to carry them through the many months during which passage is difficult and often impossible.

SALT LAKE CITY, February 27.

Ore shipments from Park City last week reached a total of 4,073,180 pounds. The Daly-Judge Mining Co. took the lead in tonnage and sent out 1,148,000 pounds of ore and 386,000 pounds of zinc middlings. The Silver King sent 1,231,180 pounds; Daly-West 1,150,000 pounds; Keith-Kearns 128,000 and the Jupiter 30,000 pounds of crude ore and concentrates.

The East Ontario Mining Co., operating at Park City, will be officered during the coming year by E. M. Curtis, of St. Louis, as president; S. V. Derrah, of Salt Lake, vice-president; S. B. Schuyler, St. Louis, treasurer; P. R. Kingdon, Salt Lake, secretary, who, with J. H. Deiter, of Salt Lake, constitute the board of directors. Byron Hartwell, of Park City, is superintendent.

The May Asphaltum Mining Co., with headquarters at Myton, Utah, has been formed to operate asphaltum claims near Myton. George Lindsay is one of the principal shareholders.

The development of the St. Louis-Magnolia group at Park City is being pushed with a working force of 15 men. This mine is located in the center of the property operated by the Silver King Mining Co. Late last year James McGregor and associates, who are the owners, became convinced that the Silver King Co. had trespassed on their ground and extracted much high-grade ore. Representatives of McGregor gained entrance to

the Silver King workings to make sure that their suspicions were correct. Shortly afterward a demand was made on the management of the Silver King for a settlement for ore alleged to have been extracted. It is said the Silver King officials responded with a counter proposition, not satisfactory to the St. Louis-Magnolia owners, and after a little more parleying, further negotiations were cut off. The owners of the St. Louis-Magnolia concluded to sink a shaft on the ground and demonstrate that ore belonging to them had been unlawfully extracted. Late in December ground was cleared for the hoisting-plant, and in January the sinking of the shaft, now 80 feet deep, was begun. Some rich ore has already been encountered.

The nearest to definite information that has come to the public concerning the ambitions of Thomas F. Cole and F. Augustus Heinze to get a foothold in Utah mining camps came out a few days ago when it was discovered that Walter Fitch, former general manager of the United States Mining Co., is representing Cole et al. in this State, and for a number of weeks has been engaged in making examinations of some of the principal mines of Stockton, Tintic, Park City and Alta. The writer has learned that Mr. Fitch put in two weeks at the Columbus Consolidated mine at Alta, during which time an exhaustive examination of that mine was made. Following this, Mr. Fitch made the management an offer for a controlling interest, it is said, of $5 a share, which was refused. There is no longer any doubt in Salt Lake mining circles about Cole and Heinze having joined with J. A. Coram in the promotion of the American Consolidated Copper Co., the purpose of which is to control mines in Montana, the Bingham Consolidated and others in Utah, the Balaklalla in California, and presumably some of the copper producers of Arizona. In short, it is the purpose of the promoters to build up a mining and smelting institution as formidable as the United States Smelting, Refining & Mining and the American Smelting & Refining companies. Mr. Fitch has succeeded up to within the last few days in keeping his identity carefully concealed, and, in fact, the promoters of the scheme to enter the field as competitors of the last-named companies have done all in their power to keep their plans from the public.

The Honerine mine, at Stockton, looks like one of the coming big producers of Utah. The drain tunnel, which has been driving during the past three years, has been completed to 9,700 ft., and has proved the presence of ore in Honerine ground of a grade much higher than that taken out on the upper levels. A drift has been run on an orebody for nearly 100 ft., the face showing rich ore the whole distance. The width of the body has not been ascertained.

The St. Patrick Mining Co. has been organized to operate in Little Cottonwood district. D. A. Buck is president, B. A. M. Froiseth secretary and A. J. Smith treasurer—all of Salt Lake.

Ore and bullion settlements for the past week were reported by Salt Lake banks to the amount of $429,500.

The Last Chance mill in Bingham is being remodeled and will soon be placed in commission again. The Last Chance mine has, except for the operation of leasers, from time to time, been idle for a number of years. The property has been taken over by the Nevada-Utah Mines & Smelters Corporation, at the head of which is John Weir, of New York. This has also acquired extensive holdings at Pioche, Nevada, and the Comet copper property in Beaver county, Utah.

The Garfield Improvement Co., an auxilliary to the Garfield Smelting Co., has contracted for the erection of 90 buildings in the new smelter and mill town of Garfield, which has been laid out 15 miles west from Salt Lake City. The buildings are to consist of a large boarding-house, bath-house, club houses and dwellings, enough to furnish accomadations for a population of 500. The new town will have modern conveniences. The Garfield Water Co., another auxiliary will expend a quarter of a million dollars in the building of a system to supply water, not only to the town, but to the smelter. A concrete flume, 8½ miles long, will bring the water to the town. The mills of the Utah Copper Co., now under construction, and the proposed Boston Consolidated plant, will be located near the town. The San Pedro, Los Angeles & Salt Lake and the Western Pacific railroads will run their main lines near it, and the Rio Grande Western will come in via Bingham Junction.

At the Garfield smelter the work of construction is progressing rapidly, and the company has already broken all previous records. The 300-foot stack is finished and the flues, which are to be 2,300 feet long.

What appears to be an important strike in the Uncle Sam Consolidated mine, in the Tintic district, was made a few days ago in a winze sunk from the 500 level. The ore is of high grade.

H. M. Crowther, manager of the Continental-Alta mines at Alta, with headquarters at Salt Lake City, has secured a ten years' lease on the right of way of the Rio Grande Western from Bingham Junction to Wasatch, and the old tramway grade, owned by the same company, from Wasatch to Alta. Mr. Crowther and associates will form a corporation to be known as the Continental Transportation Co., and will construct a standard gauge road from Bingham to Wasatch this year, and may re-build the tramway to Alta; yet the latter may not be undertaken until next year. The result will be to cheapen the cost of marketing ore from Alta mines. The camp will be put on an equal basis with Park City in the way of transportation, which is from $1,50 to $2.50 per ton.

The ore shipments from the Tintic district last week aggregated 175 carloads, the shippers being: Ridge & Valley, 7; Gemini, 16; Centennial-Eureka, 51; Bullion-Beck, 9; Dragon Iron, 15; Brooklyn Consolidated, 3; Beck Tunnel, 7; Uncle Sam Consolidated, 5; Eagle & Blue Bell, 6; Swansea, 4; Eureka-Hill, 15; Yankee Consolidated, 2; Ajax, 5; May Day, 1; Black Jack, 4; Carisa, 4; Lower Mammoth, 1; Mammoth, 15; Victor, 1; Uncle Sam (concentrate), 2.

The Boston Consolidated Mining Co. has commenced grading for two miles of standard-gauge railroad to connect the portion of its property on which steam-shovel mining is to be inaugurated with the Copper Belt Railroad. The Rio Grande Western, which owns the Copper Belt, is also going to commence the construction of another line into Bingham, penetrating the Carr Fork section of the camp, and ending near the Highland Boy mine of the Utah Consolidated Mining company.

The management of the Utah Copper Co. will award contracts for the equipment of the concentrating mill, now in course of construction near Garfield, within another week.

BUTTE, February 24.

The Butte men interested in the new mining companies being organized in New Jersey and New York are in the East, and there is little information obtainable in Butte. The directors mentioned for the Butte Coalition, the $15,000,000 corporation organized under the laws of New Jersey, are unknown in Butte, but the directors of the Red Metal Mining Co., a $11,000,000 corporation organized under the New York laws, are mostly Butte men. W. D. Thornton is one of the large stockholders of North Butte. John C. Lalor is manager of the Daly estate, and Roy S. Alley is private secretary to John D. Ryan. The objects of the organizations are unknown here, but it is surmised that they are both Cole-Ryan companies, formed to take in the United Copper, North Butte, Clark, and other mining companies, and aiming for a general combination of Butte mining concerns.

Nearly a score of new companies have been organized in the last six months to work Butte copper mines and undeveloped claims. They include the East Butte, the Butte & Columbus, the West Butte, the Butte & St. Louis, American Consolidated Mining Co., the Butte & London, the Butte Copper Exploration Co., the Butte Coalition Co., Red Metal Mining Co., the Butte-Montana, and others, among the more important companies. The Lewisohns of New York have options on the Amazon group, in the southeastern portion of the Butte district, and under the direction of J. Parke Channing the properties are being opened and examined. In the group are several mines owned by Henry Brundy, from which for a number of years he has taken rich copper ore from near the surface. Many masses of native copper have been taken out of the workings, but the ore has been in spots and pockets.

The Butte Copper Exploration Co. is pumping the water from the shaft on the Six O'clock mine and will begin sinking the shaft deeper.

The Butte & London Copper Mining Co., which owns 113 acres of ground about 1,000 ft. east of the North Butte company's ground, is making rapid progress in sinking a shaft, which in a few weeks has reached a depth of 100 ft. Machinery for a hoisting plant is on the ground and will soon be installed.

New York capitalists have become interested in the old Ophir mine, lying in the southwestern part of the city, and arrangements are being made to explore the property for copper. It has produced a lot of silver in years past, but for some years it has not paid operating expenses. The shaft on the Ophir is 300 ft. deep and the new parties interested in the mine will try to find copper at a depth of 1,000. There has so far been little or no indication of copper in the mine.

Chicago men have taken an option on the Sunbury mine, one of the small properties in the East Butte section, and will soon begin explorations in it. Leasers have been working the Sunbury for copper and have mined considerable from a small vein. Their interests in the property have been purchased.

The Raven Copper Mining Co. will soon cut the Snoozer vein at a depth of 1,500 ft., and undoubtedly a large body of ore will be opened. On the 1,200-ft. level the drifts east and west have been driven in ore and the east raise has opened a body of black copper ore averaging 12% copper. The face of the east drift is in copper glance. The west raises are in ore similar to the ore in the east raises. From the east drift a crosscut has been run south and another vein, eight feet wide, has been cut.

The Reins Copper Co. is still sinking the shaft on the Combination mine. It has reached a depth of 1,080 ft. and will go 120 ft. deeper, and from that point crosscutting will be done. Next to the shaft on the Emma mine, the Reins has been the most expensive piece of mining ever done in the Butte district, owing to the bad character of the ground and immense inflow of water.

ARIZONA.

Cochise County.

A 100-ton concentrator is being installed on the Cochise Consolidated mine, near Paradise. The mill will be driven by a gasoline engine and the hoist and pumps at the mine will be operated by electricity. The plant is being erected under the management of C. S. Hagan.——The owners of the Henkel-Taylor group, near Paradise, have arranged to extend the main tunnel on the Senator claim 250 ft. to cut the main ledge.

The owners of the Shattuck and Arizona mine, at Bisbee, are receiving bids for work on the new tramway to connect the mine with the railroad, and for an air compressor. Contracts are expected to be let within a few days. A large hoist for the Shattuck mine is now on the way from the East. On the 700-ft. level crosscut No. 1 has passed through the sulphide orebody and is in oxidized ore. Work is about to begin on the enlargement of the main shaft, and raises will be started from the 300, 500 and 800-ft. levels.——The management of the King Lead mine, near Paradise, has decided that no more chloriding will be done at this property for the time being. Development will be continued.

The Saratoga Mining Co. has contracted for sinking the shaft at the Saratoga mine, near Douglas.

Gila County.

On February 20 fire broke out at the ninth level of the Interloper shaft in the Old Dominion mine. Three men lost their lives in an endeavor to put out the fire. The efforts of the management have since been devoted to bulkheading the connections between the burning shaft and the mine. All levels have been closed except the 10th and 12th, and the latter has been flooded. The 10th level will be closed as soon as possible.

Maricopa County.

The Blue Bird mine, 16 miles north of Phœnix, has been re-timbered and development work has been resumed on the 300-ft. level.

A new hoist has been put in at the Mormon Girl mine, on Cave creek, and a new air-drill will be added.——The Oro Grande Mining Co. is arranging to prospect the lower levels of the Oro Grande mine, near Wickenburg, with diamond drills.

Mohave County.

The German-American Mining Co. is installing a compressor on its property in the San Francisco district, 12 miles east of Needles, Cal. Air-drills will be placed in operation on the Thirty-fifth Parallel and Treadwell mines. The management of the company has decided to adopt the leasing system on all of its property, except the Thirty-fifth Parallel and the Treadwell.——S. Fields, of the Arizona-Mexico Mining & Smelting Co., is putting in a concentrating mill on the company's property at Stockton Hill, near Kingman.——The New Comstock Con. Co. is unwatering the Boulevard mine, at Union Pass, 30 miles northwest of Kingman. A drift is to be driven to the ore-shoot from the 200-ft. level.——N. M. & J. D. Richardson are driving a crosscut to cut the vein on their property at Union Pass, near Kingman.——J. H. Hoffman, of the Chloride Gold Mining Co., is sinking a shaft on the company's property at Chloride. The shaft will be carried to the 500-ft. level. The owners of the Enterprise mine, near Kingman, have decided to sink the shaft several hundred feet below the present level and to install a plant later in the year.——The Cerbat Mountain Mining Co. is to put in a concentrating plant at the Vanderbilt mine, near Kingman.——The San Diego Gold Mining & Milling Co., of San Diego, Cal., has contracted for the sinking of the main shaft on their mines near Union Pass, 29 miles west of Kingman.

Pima County.

Both furnaces of the Cieneguita Copper Co.'s smelter, near Tucson, are to be started up during the coming week. A calciner is also completed and the shipping of matte is to begin early in March.——The smelter at the Helvetia mine, near Tucson, will be started up within a few days.

Yavapai County.

(Special Correspondence).—The Yaeger Canyon Copper mine, located near Prescott, is making regular shipments of high-grade ore and concentrates to the Arizona Smelting Co. of Humboldt. The property has been under the general superintendency of Chas. E. Bunker for the past two years.

Prescott, March 1.

W. F. deCamp is unwatering the Richinbar mines, at Mayer, below the 400-ft. level, and will open the property at the 500-ft. level.

The Esmeralda Mining Co. is installing new hoisting machinery on the Cornucopia mine, at Ash Creek, near Dewey, and sinking will be resumed.

The Golden Idol Mining Co. is arranging to put in machinery and open up the Dick Lyons group, near Cherry, to greater depth.——The Arizona Gold Lodes Co. is putting in a tramway to connect its mills and mines, 16 miles east of Dewey.——The Buffalo Lime Cap Mining Co., of Cherry, will continue its tunnel, now in 1,800 ft., 200 ft. farther to tap the veins opened on the surface. Power drills are now being used. ——The Federal Mining Co., which suspended operations some time ago, is preparing to resume work at its mines, near Cherry.——W. R. Allen is sinking a shaft on a newly discovered prospect, near Cherry——The owners of the Mocking Bird mine, near Weaver, have let a contract to sink their well to a depth of 130 ft. A whim is to be put in. A mill will be erected as soon as a sufficient water supply can be secured.——T. J. Carrigan has let a contract for extensive crosscutting on his property, near Prescott. The crosscut will tap the mountain at a depth of 420 ft. He is planning a 20-stamp mill.——E. S. Campbell, of the Surprise mine, near Poland, has contracted for the extension of his tunnel several hundred feet, and is preparing to build a tramway from the mouth of the tunnel to the railroad station at Poland. ——The owners of the Apache-Panther mine, at Harrington, are building a wagon road from Crown King to the mine. A hoist is to be installed in the near future. ——The Lynx Creek Gold Co., owning 18 quartz and placer claims on Lynx creek, five and one-half miles east of Prescott, is to put in a 200-ton plant.——The main shaft of the Chancellor mine, near Prescott, will be sunk 100 ft. farther before beginning to crosscut.

CALIFORNIA.

Amador County.

At the South Eureka the new electric pump, with a lift of over 1,800 ft., has been in successful operation at the mine for the past two weeks, handling most of the water from the Central and South Eureka.——R. Kimball is reported to have found a gold pocket in the Dead Sheep mine, near Defender.——In the Kennedy, at Jackson, they are drifting at the 2,850 level to the west or foot-wall ledge. The 100 stamps are in operation.

El Dorado County.

A compressor and machine drills have been installed at the Cedar Creek mine, near Fair Play.

Kern County.

The Little Butte Mining & Milling Co., at Randsburg, has leased to C. S. Taylor and H. J. Giadoni the Little Butte mines.

Mariposa County.

The new owners of the Three Tree mine, five miles from Hornitos, have completed the electrical equipment of the mine. It is announced that new machinery will be put in.

Mono County.

E. S. Smith has taken a bond on the Con. Pacific, owned by T. Colligan; the Midnight and Flagstaff, owned by T. and J. S. Cain, and the New Standard, owned by Mrs. Belmont and John Long. The bond requires that $12,000 worth of work be done within four months. All these mines are in the Masonic district,

near Bridgeport.——T. V. Whitelaw will commence active operations on the True Friend group, at Masonic.

S. Cavanaugh, lessee of the Ward mine at Castle Peak, near Bridgeport, has suspended operations on account of the heavy fall of snow.——A tunnel is to be run from the lower canyon to cut the main ledge of the Julia & Myrtle mine at Lorena, near Bridgeport.

Nevada County.

The new pump for the Ironclad mine, near Grass Valley, has been installed.——E. F. Hilton and F. Page of San Francisco, and A. Taft of Kansas City, have bought the Morayanda mine, near Newtown.——The Union Hill Consolidated Mines Co. will hold a stockholders' meeting on March 10 to consider the disposal of its property.

S. H. Dille has sold his 10-stamp mill, at Dutch Flat, to the Ironclad Mining Co., and it will be moved to the Ironclad mine at Rough and Ready.

Plumas County.

John Chamberlain and William Brown, of Cascade valley, are in San Francisco arranging for machinery for their quartz mine near Cascade Valley, on the line between Butte and Plumas counties.

San Bernardino County.

L. A. Milligan has sold five claims near Barstow to Henry Mountain and William Schell of New York for $22,500.

The sampling plant at the Needles smelter is being installed this week by the Arizona-Mexican Mining & Smelting Co.——The reported discovery of rich ore by C. H. McClure, 15 miles south of Needles, has resulted in a large amount of prospecting in that locality. A new town, known as McClureville, has sprung up about the McClure claim.

San Luis Obispo County.

The Silver Swan mine, near Cayucas, has been sold by I. Holt and R. L. Dempsey to S. Clark.

Shasta County.

The Mammoth Co. is preparing to prospect extensively near the surface on its orebody near Kennett, by means of diamond drills.——Charles Dozier is installing a 25-ton cyanide plant at the National mine, four miles south of Kennett.

It is reported that silicious gold ores will be shipped from southern Oregon to the smelter of the Mammoth Copper Co. at Kennett. The Mammoth ore runs usually about 10% silica, 35% iron, 45% sulphur, $3 gold and 5% copper. The coke used is shipped round the Horn from Belgium. Tests of Washington coke are being made. ——It is reported that another smelting plant will be erected in Shasta county. The owners of the Balaklala mine are clearing ground for reduction works. It is said that they will build reverberatory furnaces to be fired with oil, mechanical roasters and converters.

Fourteen miners and helpers were added to the force of the Mammoth mine, near Kennett, this week.

The Mountain Monarch Gold Mining Co. has begun operations five miles west of Shasta. An aerial tramway is now being built from the mine to the millsite. The company is figuring on a cyanide plant.——The Mammoth mine, in the Old Diggings district, near Redding, is to be developed by G. Hurst, of Redding, and J. M. Sweeney, of Detroit. Mr. Hurst is arranging for extensive development at the Iron Mountain mine, at Iron Mountain, near Redding.——Engineer White, of Salt Lake City, is now at Kennett looking over the ground for the proposed smelter for the Balaklala mine. ——The third furnace of the Mammoth Co., Kennett, is practically completed, and will be blown in during the next few days. A new motor-generator was placed in the power-house this week and the new compressor and drills at the mines began operations a few days ago.—— The Farontul and Gopher claims at Madox gulch, near Kennett, have been bonded to N. W. Keith, who began development this week.——A bag house is to be provided at the After Thought mine, near Bella Vista, to save the zinc in the form of zinc oxide.

Sierra County.

(Special Correspondence).—The machinery for the electric power plant at the Tightner mine is being installed.——The Alaska mine, at Pike City, recently tapped the shaft with a drain tunnel.——The Rainbow mill, at Alleghany, is running on fair grade rock.—— The King Con. group, in Keystone ravine, owned by J. Hayes, L. Flint and others, has been bonded to San Jose parties, who will begin development.——Work is progressing on the drain tunnel at the Marguerite.—— Turney, Flint & Nickols have struck a good prospect in the gravel below the mouth of Ladies Canyon.——Good ore is being mined at the Sovereign.——The Empire has the electric plant about ready to run again.——The Last Resort is up 25 ft. with their raise, in good ore.—— F. C. Le Blond, one of the principal owners of the Hilo, arrived this week. They have plenty of water to wash gravel and are washing up their dump.——Spaulding & Peckwith have water and are washing good gravel.—— The White Bear has a large crew breasting.——P. H. Mason, superintendent of the Golden Scepter, reports work favorably progressing at the mine.——The Telegraph is closed down temporarily, owing to the electric pump not working satisfactorily.——J. S. Wallace, superintendent of the Antlers, reports the tunnel nearly into the ledge.

Downieville, Feb. 24.

Siskiyou County.

The Freshour Bar claim, at Gottville, has been pumped out and work has been renewed in the bedrock gravel.——The Blue Gravel mine, at Greenhorn, near Yreka, is being opened up by sinking a new shaft and drifting along bedrock. The pumps have been taken out of the old shaft and will be put in operation again. The Pine Grove placer claim, at Oak Bar, near Yreka, is being opened up. A hydraulic elevator will be installed early next month.

The owners of the Hamilton mine, at Oro Fino, have ordered machinery and will sink a perpendicular shaft 200 ft. A mill has been ordered.

Trinity County.

The Trinity Copper Co., of which Thomas Lawson is president, has a large force at work on the Shasta King mine and will also build smelting works.

Tuolumne County.

Two men were badly injured by the premature explosion of a blast, on February 24, at the Blackhawk mine, near Soulsbyville. The men were ascending the shaft after having spitted the fuses.——H. H. Cloud has bought the Esmeralda mine at Second Garote, from C. W. Sheridan, and will continue its development.

COLORADO.

(Special Correspondence.)—A late report is to the effect that several miners had erected a small mill outside the Cripple Creek district for the purpose of treating the high-grade material which they had secured from mines in the district. The men were arrested charged with 'high-grading.' Efforts are being made by the operators to stop the wholesale stealing of the high-grade ore from the mines. It has been impossible to convict parties charged with high-grading heretofore even though the owner of the ore identified same as being his own. Heretofore it has been the custom of the ore thieves to dispose of the booty to assayers, either in the district or others dealing in that class of material, receiving from 25 to 50% of the value of the ore. If the purchaser found that the party was afraid of being caught with the goods the percentage would not be as high. A number of assayers have been run out of the district who it was claimed were acting as a 'fence' for the ore thieves.

The new railroad contemplated to run from Ft. Collins, about 75 miles north from Denver, through Wyoming, will open up a large tract of country hitherto practically undeveloped. Incorporation papers have been filed with the Secretary of State.

It is understood that Gov. McDonald will be called upon shortly to make a thorough investigation of the explosion in the coal mine of the Victor Fuel Co. in the Maitland district whereby several men lost their lives.

A number of labor organizations of this State have recently passed resolutions condemning the actions of the Idaho and Colorado authorities in arresting and taking to Idaho from Colorado the head officials of the Western Federation of Miners. The officials who were arrested about one week ago are said to be implicated with Harry Orchard, under arrest, in the murder of ex-Gov. Steunenberg of Idaho. They are in jail in Idaho awaiting trial. Some of the unions are reported as having subscribed several thousand dollars to the fund for the defense of the men arrested.

If good weather continues in the mountains it will not be many weeks before the placer mines commence operations. It is reported by a prominent engineer who has been in charge of large placer properties the past year, that snow in the mountains above Alma and Breckenridge is not as plentiful as a year ago, yet it is in better condition as it has drifted into the gulches and timber and is well protected. In many of the gulches it is practically solid ice which means it will be a long time in thawing out and much better for placer work. The placer interests of the State are becoming extensive and this year will see much activity, especially in Park and Summit counties.

Denver, Feb. 26.

Fremont County.

The prospective electric road from Canon City through Eight-mile park to the top of the Royal Gorge is interesting mining men. It is eight miles from Canon City, yet the inaccessibility of this region has prevented any extensive development of its mineral wealth. In 1900 E. E. Smith located 200 acres of mineral land near the gorge and has done some developing. Garnets, sapphires and green and pink tourmalines have been found, and on the claims in quantity are the ores of tantalum, tantalite and columbite. Tantalum is now in demand for use as filaments in incandescent electric lights. Samples of ore sent by Mr. Smith to Bremen, Germany, for analysis show a range of from 20 to 74% of tantalum pentoxide. The ore is found here in placer deposits and in leads of white quartz. About 1,000 lb. of the ore have been taken from the claims and development has been only begun.

Ouray County.

(Special Correspondence).—The Barstow Mining & Milling Co., operating the Barstow mine, near Ironton, along with other improvements, will instal another large air compressor, an electrically-driven pump and is considering a first-motion hoist. The mine development work of the past year has opened large shoots of good grade milling gold ore. The recent strike of ore on the Mineral Farm, near Ouray, is leading to a more thorough prospecting of the contact area in that vicinity. Heretofore bodies of ore have been found in that so-called gold belt which have yielded large and permanent profits to the owners, who extracted the ore and shut down the mine.

Ouray, Feb. 24.

Among the mining enterprises in the Red Mountain and Ironton districts is the Continental Smelting & Refining Co. The old Saratoga mill is now owned by this company, and a large amount of money is being expended putting it in shape in order to handle the low-grade ores, of which there is a large quantity in these districts. Already two furnaces have been purchased, one being in place. As soon as the weather improves, work on the smelter will be resumed and the second furnace installed. The company holds under lease a quarter section of land, which includes the Comstock, Vest, Saratoga and others. These can supply the smelter with ores for at least 20 months. Many properties in the same territory not controlled by the company have low-grade ores which can be obtained. The principal properties are the Ironsides, Gibson-Dutton and the Yorktown group. The Mono-Baltic is said to have 40,000 tons of ore blocked out and is only a short distance from the smelter. A large tunnel is planned and will be commenced in the spring. The ore in the Saratoga lies in a blanket vein and is silicious iron oxide, 20 ft. thick in many places. The silver averages from 6 to 25 oz. There is also in the Saratoga a rhodonite vein carrying from 8 to 10% copper.

A citizens' committee has been formed at Ouray, to find ways and means to prospect the limestone and other formations beneath the town. This is to be done by means of the diamond drill.

IDAHO.

The report of State Mine Inspector Robert N. Bell for 1905, recently issued, states that in the mining industry in that State 6,000 men are employed, of whom about 3,000 are in the Cœur d'Alene. The total number of fatal accidents reported from all causes was 20, as compared with 10 during 1904, for approximately the same number of employes. The causes of these fatalities were the following:

Explosion of blasting compounds	5
Falls of rock	5
Falling down chutes	3
In moving of cage	2
Contact with trolley wires	2
Moving car	1
Caving of ground in placer mine	1
Gasoline tank explosion	1
	20

Each of these accidents happened singly to the unfortunates, except in one instance where two men were killed by a fall of rock. The Inspector expresses the opinion that the most of these accidents resulted from the personal carelessness of the men.

Boise County.

E. F. Blain, of Placerville, states that he will get his dredge started about March 1.——Dr. Fairchild and associates will run a tunnel about 4,000 ft. long to cut a system of ledges at the head of Boyle gulch, near Placerville. They expect to tap the main ledge at a depth of 1,000 feet.

Idaho County.

Harry J. Cone is planning to put in a reduction plant at his mine, near Elk City. He is at present watching experiments of the Idaho Reduction Co., at Lewiston, upon the result of which his future course will be based.

Kootenai County.

Extensive operations will soon be commenced on the Port Arthur mine, near Sand Point.

Nez Perces County.

The Gateway Mining & Milling Co. is arranging to build a five-stamp mill on its property, near Pierce.—— The owners of the Ozark mine, near Pierce, will replace the present rocker mill with a five-stamp mill.——All of the flats near and on Orofino creek, near Pierce, have been sold for dredging.

Shoshone County.

A second tunnel, to run 1,100 ft., which will intersect the vein at a depth of 500 ft., has been started by the St. Louis-Idaho Mining Co. on its claims, near Burke. ——Theodore Anderson, of the Rex mine, near Wallace, will begin operations at the mine within a few days. The machinery at the mill is now being overhauled and put in shape.——The new crosscut tunnel at the Yorktown mine, near Osburn, has cut the vein at a depth of over 300 ft. from the surface. A drift has been started toward the Blue Grouse property.——The Mineral Point mine, near Osburn, is crosscutting its ledge 400 ft. below the old workings.——The owners of the Surprise mine have completed the first 100 ft. of the proposed 400-ft. crosscut tunnel.——Charles H. Dow and Ralph Woodworth, of Boston, have completed the purchase of the Amzel Samuels and Mrs. H. C. Bickerton interests in the Hercules mine for $62,500.——The Alhambra Mining & Milling Co. have struck the foot-wall of the vein on its mine, near Wardner, and is drifting. The main tunnel is in 1,400 feet.

Clearing of the 1,400-ft. shaft at the Frisco mine, four miles from Wallace, has reached the 500 level. It will require three months to put the mine in shape. When operations are resumed the mill will be equipped to save the zinc in the ore.

Washington County.

The Hancock Copper Mines Co., Ltd., is arranging for the erection of a plant, near Landore, to operate under the Dewey process. The machinery will not be purchased until after the return of C. F. Drake, manager to the company, from Boston.——G. Sperling engineer for the Syndicate Mining, Milling & Smelting Co., of Weiser, has completed a survey of the company's mine.

MONTANA.

Jefferson County.

The owners of the Blue Bird mine, near Wickes, are opening up and re-timbering the main tunnel.

Lewis and Clark County.

Lessees of the Helena mine, at Helena, struck a new vein while drifting on the original lead at a depth of 150 ft. —— M. W. Alderson has secured an option on the Goudy claims, near Austin, and will proceed with development.

Silver Bow County.

The compressor and electric pumps for the Lexington mine, at Butte, are on the ground, but no movement has been made toward installing them. —— The Columbus-Butte Co. has begun work on its 1,200-ft. shaft on the La Monte claim. —— The Butte cyaniding plant at Centerville has suspended operations.——The owners of the Reins mine, at Butte, will sink the shaft an additional 120 ft. and crosscut.

The Gagnon mine at Butte has been closed down to retimber the shaft between the 1,000-ft. and 1,300-ft. stations. The mine will be closed for about six weeks.—— The Never Sweat mine at Butte has re-timbered the shaft between the 200 and 650-ft. levels, and has resumed operations.

Yellowstone County.

M. J. Bergin, president of the Columbus-Butte Mining Co., is considering equipment of the company's mine at Columbus with heavier hoisting machinery, and sinking the shaft to 1,200 feet.

NEVADA.

Esmeralda County.

The hoist of the Nevada-Goldfield mine was put in operation on February 16. Sinking has been resumed on the 100-ft. shaft, which will go to a depth of 500 ft. before crosscutting.——Kenneth Wade has engineers surveying the Lucky Strike property, near Lida, preparatory to active operations.

The Montezuma Co. has adopted the leasing system at its mines and claims at Montezuma and has already given year leases on the Arizona, Bullion, Benton and Caraccas properties.

Louis Stevens has hauled the boilers, air compressors, drills and other machinery to the American Nickel Co.'s mines at Cottonwood, and has been given a contract to furnish 400 cords of wood for that company. A new hoist is expected to arrive at Lovelock for this company, which is developing the Nickel and Cobalt mines.

Frank Helm, of Goldfield, is at Manhattan, arranging for the construction of a mill for the Oddie-Gardner Co., of Goldfield.

C. Kaufman and J. J. Hall, of Corning, Cal., and G. Kraft, of Oroville, Cal., have taken a lease on the Florence, near Goldfield, and have purchased a gasoline hoist, boiler and whim. —— On the Gaston lease, at the Atlanta mine near Goldfield, a crosscut has been started at a depth of 160 ft. from the working shaft. —— Ore-bins are being built and a new hoist erected at the Great Bend mine, near Goldfield. —— The new shaft at the Adams mine cut a body of low-grade ore this week at 75 ft. Sinking is to be continued. —— The Goldfield Northern Mining Co. has begun work on its property, four miles north of Diamondfield. —— The Lida Queen Mining Co. has decided to let leases on its claims at Palmetto, near Goldfield, except the Fortunis and Buster claims.

Elko County.

The 60-ton smelter of Gage & Turner, at Mineral Hill, was started up on Feb. 17. Mr. Gage is preparing to put in a smaller plant at the Sutherland antimony mine, 14 miles east of Lovelock.

John Green has struck a ledge of gold ore in the Bullion district. The ore is white quartz.

Humboldt County.

Henry W. Kent is opening up a group of claims in the Dun Glen district near Winnemucca.

Lincoln County.

(Special Correspondence).—The electric plant at the Quartette mine is being enlarged. They are also installing a compressor and a 100-h. p. engine and increase the voltage to 60 kw. The present equipment consists of a 35-kw. dynamo, driven by a 40-h. p. gas-engine.

Superintendent Rose, of the Southern Nevada mine, has a large force at work on the Blossom crosscutting, drifting, sinking and timbering. The shaft is down 430 ft., and on the Goodenough adjoining they are drifting east and west on the 110-ft. level.

At the Duplex they are doing considerable crosscutting to connect with the two veins. Superintendent Barnes is also developing the Fraction, New Year's Gift and the Good Hope mine, on the latter being down 600 ft., with several crosscuts to the vein.

Owing to the large flow of water developed on the Pompeii, work has been suspended except on the new shaft 100 ft. west of the main shaft. A new pump of 500,000 gal. daily capacity is to be installed, after which work will be resumed. A strike of rich ore was made on this property at the 262-ft. level. It shows three feet of ore, said to average $300 per ton.

Searchlight Mining & Milling Co. report having struck a large body of high-grade ore at a depth of 250 ft. The ore runs from $60 to $220 per ton.

Camp Sunrise reports a big strike by Halquist & Hummel, the original locators. On the Estrella claim they uncovered two veins close together. F. W. Holmes, George Morrison and C. R. Topping have taken up five claims and are working them.

El Dorado canyon reports a strike on the Silver Legion. At a depth of 120 ft., while sinking through a granite wall, they encountered a ledge of quartz that runs $600 per ton in gold and silver. Some fine specimens were brought in and sacking is to begin for a trial shipment.

Three miles north of Searchlight, just outside the mineral belt, the Oregon group, now being developed by the Searchlight Consolidated Co., at a depth of 70 ft. opened up a two-foot ledge that averages $180 per ton. The ledge has been exposed at intervals, but the ore has been mostly low grade. Contract has been let to sink the shaft to 500 feet.

The Cyrus Noble have started their 10-stamp mill and are milling 40 tons per day. They have 800 tons on the dump. Superintendent Luxon is enlarging, timbering and improving the shaft, and constructing a new building for the electrical plant to be installed. Some good ore has been found in the lower levels while drifting the past week.

Too much water is the report from the Santa Fe and the Big Six mining companies. On the former, at the 200 level, the water has more than doubled until there are now 10,000 gal. The Big Six has struck a small flow of water, which is increasing as they go down, and a pump will be installed.

Surveys have been made for the pipe-line from the Pompeii mine to the town of Searchlight, a corporation having been formed to build reservoirs and supply the town with water for domestic use and the mines for milling.

The Mountain group, in El Dorado canyon, has been bonded by C. L. Gresh and E. J. Roberts for $50,000 from Gennes & Copp. They are acting for several Pittsburg capitalists, who are also heavily interested in the Venus, Black Hawk and El Dorado properties. They have a shaft down 125 ft., and everything pans. A large force is at work, and a 15-h. p. hoist is on the way. Superintendent Gresh, of the Black Hawk mine, reports that the 10-stamp mill now being constructed will begin operations on March 15. The Combination group, 2,800 ft. from the Black Hawk, has been bonded to a syndicate of San Francisco men.

Searchlight will soon be illuminated by electricity, as plans for the power-house are drawn and the contract to build will be let as soon as all the specifications are completed.

James Portalis, of Austria, who is interested in Colorado mines, has purchased one-half interest in the Duplex and Good Hope mines at Searchlight.

Searchlight, Feb. 24.

(Special Correspondence)—Again is Pioche promised a railroad. This time the San Pedro, Los Angeles & Salt Lake Railroad gives positive assurance of an early connection between Caliente and Pioche. The grade has been made and is in good condition. In anticipation of its completion and coincident with the recent advance in the price of silver, a number of abandoned mines are now being re-opened. First of these are the old Raymond-Ely and Meadow Valley, now being worked by the Nevada-Utah Mines & Smelters Corporation. This company has repaired the old hoists and is retimbering the Meadow Valley No. 5 shaft, on the east end of their property. This has three compartments and is down 1,400 ft. on the incline. Pumps are to be put in and work started below water level, in hope of developing a continuation of the rich orebodies above. A crosscut is also being run to tap the Yuba-Mazeppa vein. At the west end of its property the company purposes to work the Raymond-Ely vein and the Black Ledge through the No. 1 shaft to the 1,200-ft. level. Contracts are to be let for an electric power plant to furnish current for the hoists and pumps. The Day mine, at Jack Rabbit, is being worked by the same company, who have re-constructed the railway to Pioche and are running ore trains. An aerial tram is being built from the Day to the railroad terminus and large ore-bins have been finished. Electric power is to be transmitted to the Day from Pioche. It is as yet undecided whether to start the smelter at Pioche or to ship ores to Salt Lake City. Geo. F. Milligan is engineer in charge.——Godbe Bros., of Salt Lake City, propose to start extensive operations on their properties adjoining those of the Nevada-Utah Co. They are also prepared to treat the tailings pile at Bullionville. Cone classifiers will be put in to separate the sands and slimes. The sands will be treated by fine grinding in tube-mills and agitation and cyanidation in the Godbe agitators. The slimes, which carry values in lead, will be filter-pressed and either shipped or smelted at the mine.——The properties owned by Simon Bamberger and J. D. Wood have been patented and it is reported that work is to be started soon.——Arbogast & Mulhall are working gold mines two miles east of Pioche. ——The Yuba-East case was decided in favor of A. W. McEwen, but has been appealed by Lloyd & Cook, who are said to have taken out $5,000 in one month's work. ——The Boss claim, near Pioche, has been bought by Miller and associates, of Boston, who intend sinking a working shaft. E. P. Gordon has charge at the mine. ——A. W. Scott and E. H. Sheu, of Salt Lake City, are working 2½ miles west of Pioche, on a manganese-gold mine, which they have under option.——The Advance Mining Co., D. J. Lawrence president, is shipping ore from the Chief district, between Caliente and Pioche. ——Considerable work has been done by Lloyd, Cook & Osborn on the Mendah mine, seven miles west of Pioche. ——W. G. Nebecker and Hugh Tarbet will take up their option on the Bullionville mine, where a large low-grade lead-silver ore has been opened up.——The district is attracting much attention, the stages are loaded with men, lodging-houses are full and charging double prices, and real estate is booming.

Pioche, Feb. 24.

Geo. Freer and Dan Harris are planning to erect a five-stamp mill on their Grand Canyon claims, near Caliente. ——Crushing will begin at the Cyrus Noble mine, at Searchlight, on March 1. Sinking for the 600 ft. level has been resumed and a raise from the third level has been completed.——F. J. Harrington and Mr. Luxon are planning development for the Big Eight property, near Searchlight.——The flow of water in the Pompeii mine has increased until it is now reported to be 160,000 gal. daily.

Lloyd, Cook & Christian have opened up an old copper claim at Bristol, 28 miles from Pioche, and have put 30 men to work. The ore is being hauled to Modena.

Joseph Dedericks of Salt Lake has taken a contract to put in the 100-ton smelter of the Good Springs Smelting & Development Co. at Good Springs. He will begin work during the present week. The company is having plans drawn for a 6½-mile electric railway to connect the mine with the San Pedro, Los Angeles and Salt Lake Railroad.——The owners of the Alcott mine, eight miles from Good Springs, are to drive a 350-foot tunnel, from the terminal of which drifts will be run.——The Black Hawk Mining Co. is erecting a mill on its property in El Dorado Canyon near Searchlight.——Superintendent J. F. Gibbs of the Nevada Gold Butte Mining Co. has selected a site and begun work on a 1,000-ft. tunnel on the Gold Butte mine near St. Thomas. This tunnel is expected to cut the six veins on the property.

Lyon County.

The Nevada Reduction Co.'s plant at Dayton is to be enlarged. An electric plant and a 100-stamp mill will be built on the old Eureka millsite. The company has bought the Winters, Sutro, Illinois, Davis, Sweetapple, Metallurgical, Excelsior and Rock Point mill and power sites, and will connect its mills with the Nevada & California Railroad.

Nye County.

The National Bank mine, near Rhyolite, is to be equipped with a 10-stamp mill to be operated by electricity.

Butler & Ramsey, operating the Congress mine, near Johnny, began work last week on the western extension of this property, known as the California mine.

The German-American Mining Co. has contracted for the erection of a blacksmith shop, engine-house, bunkhouse, boarding-house, etc., at its mine near Tonopah. Bids have been received for sinking a 600-ft. shaft. An electric hoist has been placed and sinking is to begin next week. —— A 50-h.p. engine has been ordered for the Clifford mine, at Clifford hill, near Tonopah. —— The main working shaft at the California-Tonopah mine, at Tonopah, now down 678 ft., will be sunk 125 ft. farther before crosscutting is begun. —— The newly organized Manhattan Gold Mining & Milling Co. has decided to lease three of its claims and to work the remaining claim. Six leasers are at work.

Washoe County.

(Special Correspondence.)—At Olinghouse, in White Horse mining district, the Fall River Mining Co. is sinking a double-compartment shaft on their property known as No. 1, recently purchased from Short Bros. of Reno.——The Green Hill-Nevada Corporation, owners of mining property formerly belonging to E. Olinghouse, will build a standard gauge railroad into Olinghouse canyon and will erect a 25-stamp mill on the Truckee river. The citizens of Wadsworth have agreed to grade the roadbed in consideration of the location of the mill at that place. The road and mill will be completed within 90 days. This company has taken over the plant of the Wadsworth Electric Light & Power Co., on Truckee river.——Gov. Sparks and associates have let a contract for a tunnel on their Oro claims, in Stud Horse canyon.——A rich body of ore has been struck in the lower level of the Keystone-Nevada.——The long tunnel on the Optimus has been advanced 200 feet, cutting five parallel leads. This tunnel will tap the water supply in South Olinghouse canyon.——The lower Springfield mill is running on ore from the Texas-Nevada.

Olinghouse, Feb. 26.

The Nevada Exploration Syndicate, of Reno, will drive a tunnel in White Horse district, to crosscut at a depth of 1,800 ft. the veins in that zone. Air compressors and machine drills are to be installed.

The Charlton Mining & Development Co. has been incorporated to operate mines in Nevada. The incorporators are H. Charlton, J. H. Webb, O. W. Anderson, D. L. McLean, George H. Urban, D. H. Gillis, all of Sacramento, C. T. Short of Reno, and William Hebard of Truckee. The principal place of business will be Reno.

Pres. Stephenson, of the Green Hill Mining Co., is negotiating for electric light and power machinery, after which he will proceed with plans for the construction of an 80-stamp mill on the Truckee River, at Wadsworth, and for the construction of railway from Wadsworth to Olinghouse.

White Pine County.

Engineer Biddleman is at Ely arranging the details of the Nevada Consolidated Co.'s smelting works. It is given out that four units, each of 1,000 tons capacity, will be put in.

It is expected that about 5,000 people will be in the camp at Ely as permanent residents in seven months. The Nevada company alone will give employment to 1,200 men.

NEW MEXICO.

Grant County.

The Comanche Mining & Smelting Co. will, about March 1, put two corps of surveyors at work to survey a narrow-gauge railroad from Silver City to Leopold, in the Burro mountains. This line will be used in hauling ore to the company's smelter at Silver City.——The Aurora Mining Co. has increased the working force at the Last Chance mine, where three shifts are now being employed.

Taos County.

S. M. Malette has resumed development of the Ajax mine on Pioneer creek, near Red River. —— Work has been resumed on the Edison mine, near Red River. New machinery is to be installed. The main shaft is being continued.

Grant County.

Definite announcement is made by the Comanche Mining & Smelting Co. that as soon as it has its narrow-gauge line from Pinos Altos completed from Silver City, which will be by March 1, two corps of surveyors will be put into the field to survey a narrow-gauge line from Silver City to Leopold, in the Burro mountains, and that this road will be finished by December 1 of this year. The line is to supply cheap haulage of concentrating ore from the mining properties of the company to its smelter at Silver City. The ore is blocked out and awaiting mining and shipment. The company is excavating for a new smelter at Silver City, and is grading a tramway from its concentrator to the briquetting plant of its smelter.

Six houses for employes are being built by the Aurora Mining Co., operating the Last Chance mine at Pyramid. Three shifts of men will be employed.

The Robert E. Lee Co. will purchase new machinery for its property, near Lordsburg.——The Bonny Co., which closed its mine at Lordsburg a couple of weeks ago, is buying machinery and supplies with the intention of re-opening.——The Hermosa Copper Co. has equipped an assay office and sampling plant at Hanover.——The owners of the Last Chance mine, at Lordsburg, will sink the main shaft 100 ft. farther to open new stoping ground.——The Lost Chance Mining Co. has purchased whims, hoists and other machinery for its mines at Central, and is negotiating for the purchase of the Old Texas mill at that place. The double-compartment shaft on the Lost mine is to be sunk to a depth of 500 ft. A steam hoist will be used in this work. The company is also sinking a shaft on the Bismark claim and has leased a San Jose concentrator, which will be altered and improved.

Taos County.

Gilleland & Merlin have suspended work on the Edison mine, near Red River.

OREGON.

Baker County.

Albert Geiser, lessee of the Bonanza mine, in the Greenhorn district, will start up the 35-stamp mill at Geiser this week.——Two crushers have been received at Sumpter for the Imperial mine. The remainder of the plant is expected to arrive this week.——D. W. C. Nelson, manager of the North American Mining Co., is installing an Ingersoll drill at the company's mine in the Mineral Springs district, near Baker City.——P. R. Bishop, manager of the Climax mine at Bourne, is putting in a reverberatory smelter at the mine.

Thompson & Co. are preparing to begin work on their Powder River claims, near Sparta, with a hydraulic

plant. —— The owners of the Standard mine, near Prairie City, are putting in a new reduction plant.—— A new sinking plant is being installed on the Dixie Meadows mine, near Prairie City.——The Copperopolis mine shipped its first concentrates to the Sumpter smelter last week. A 125-ton reduction plant is being put in at this mine.——The 10-stamp mill at the Gold Hill mine, near Durkee, is to be moved from its present location on Swaze creek to a point nearer the mine, abundance of water having been found in the Spring gulch vein. A sinking plant is to be installed.

Crook County.

The Gatewood Mining & Trading Co., which has bonded the Mayflower mine, near Howard, has let a contract for the erection of a five-stamp mill on the property. A cyanide plant will be put in.

Douglas County.

Arrangements are being made by the North Fairview Mining Co. for a mill near Bohemia.

Jackson County.

A. H. Gunnell states that the foundation for the 10 additional stamps at the Opp mine, near Jacksonville, is completed, making 20 stamps, which it is intended to increase to 40 by the end of the year.

Josephine County.

Frank Fowler, general manager of the Gold Pick mine, on Boland creek, eight miles from Holland, has completed the installation of a stamp mill and a concentrator.

The Southern Pacific Gold Co. took possession of the Grouse Mt. mine, four miles east of Grants Pass, last week, and preparations are now under way for the installation of a cyanide plant and electric hoist.

SOUTH DAKOTA.

Lawrence County.

The New England Homestake is a new company organized to develop 80 acres of territory lying northeast from the Caledonia mine of the Homestake Co. The main office of the company is at Hartford, Conn. A double-compartment shaft will be commenced on the vein. The main vein of the property is supposed to be the extension of the Caledonia and can be traced the full length of the New England Company's holdings.——The Elliptic Co. will resume sinking at the main shaft during the week. Some weeks ago a hole was bored in the bottom of the shaft to a depth of 460 ft. In sinking 119 ft. with the drill, 14 ft. of gouge was found overlying the quartzite, which is 25 ft. in thickness. The three-compartment shaft will be sunk to quartzite, when prospecting will be begun to find the ore-shoots which pass through the Maitland Company's property, west from the Elliptic. This is the first drill work of the kind to be done in the Maitland district, and the results will prove a stimulus to mining in the flat formation of that section.

UTAH.

Beaver County.

G. H. Waterbury, is superintending construction of a leaching plant at the properties of the Newhouse Mines & Smelters corporation, at Newhouse. The plant will have a capacity of 40 tons of ore daily. It is intended to leach the oxidized ores of the Cactus group, which show an average of 5% copper with some silver and gold.——A steam shovel is now at work on the properties of the Newhouse Mines & Smelters corporation in this county. The caving system of mining introduced in this country by Duncan MacVichie, is now in use at several Utah mines, and shows a reduction in the cost of extraction. With the steam shovel at the Cactus mines the management will add materially to the output at less cost. The enlargement of the mill at Newhouse is contemplated to a capacity of 1,500 tons daily.

Morgan County.

M. A. Dougherty, manager of the Carbonate Hill Co.'s property in Weber canyon, reports that ore-bins are being put in by the company at Strawberry Switch, three miles from Peterson.

Summit County.

It is reported that the Naildriver mine, at Park City, will resume operations.——The Daly-West mill, at Park City, was disabled last week by the breaking down of the engine operating it.

WASHINGTON.

Chelan County.

All the machinery has been installed in the new 20-stamp mill at the Washington Meteor mine, near Blewett, and as soon as the tunnel is completed the mill will be started up. It is intended to strike the orebody about 85 ft. below the old Peshastin workings. When the orebody is reached, drifting will be started in both directions. Machine drills have been installed.

Ferry County.

(Special Correspondence).—Since resuming work in the Quilp, 30 tons of ore have been shipped daily to the Sullivan Smelting Co. at Marysville, B. C. It is expected that all of the levels will soon be operated to their full capacity. Success is claimed for the concentrating tests of various lots of ore from different mines of the camp at the Mountain Lion mill. Six tons of concentrates have been shipped from the ores of the Ben Hur, Quilp and Pearl Consolidated to the Granby smelter, at Grand Forks, B. C. The concentrates from ore on the 600-ft. level of the Mountain Lion mine are being cleaned up. The tests appear to be along lines of amalgamation, concentration and cyaniding. The ore, after passing over the battery plates, goes to two Frue vanners, by which 75% to 80% of the value of the ore is said to be saved. The tailings are then cyanided for what remains in them.

Ore is being shipped in small quantities from the Mountain Lion mine. The low-grade material will be treated at the mill. If the tests have proved as successful as they have been reported, the mill will probably be remodeled and additional concentrating tables installed.

The drift on the foot-wall at the 190-ft. level of the Lone Pine is in 138 ft. and streaks of silver sulphurets are seen in the face. For delivering mine timbers and fuel, a grade has been cut alongside and a tramway built down the face of the hill to the track of the Washington & Great Northern Railway and a small steam hoist will be set at the head of the tramway. A dump of 400 tons of second-class ore is being shipped to the Granby smelter. Twenty men are employed.——The production of the Ben Hur mine has been increased to 20 tons of ore a day. It is rich in silver and gold. Some of it is visible to the eye. Four carloads of this ore were shipped to the Trail smelter at Trail, British Columbia.

The vein on the Shamrock claim, owned by Trowbridge Bros., near Dutch Jake's camp, 3½ miles west of Curlew lake and eight miles north of Republic, has a shaft down 40 ft. on the foot-wall in a five-foot vein, which assays $19 a ton in gold, copper and some silver. The full width of the vein is not known, but the cropping is very wide.——No. 2 crosscut will be started in a few days on the vein at the Oversight mine from the foot-wall side. Superintendent E. J. Delbridge is making a trial of different makes of machine drills in the various kinds of ground encountered on the Oversight.

Perrott & McCormack have made a good strike on the Stemwinder claim, which adjoins the Phil Sheridan on the north. The streak is six feet wide and assays $70 a ton, chiefly in silver, but carrying $6 a ton in gold. The last car of ore shipped from the Phil Sheridan mine, at Sheridan camp, to the Granby smelter was as follows: Net weight, 39,908 lb.; assay value, 84.40 oz. silver and 0.11 oz. gold per ton; allowed for the shipment, $1,093.62; haulage, $100; railroad freight, $41.10; treatment, $109.74. The net profit over mining, transportation and treatment was about $60 per ton. It is expected after this to ship about 30 tons a month. There remains over 200 tons of ore on the dump. P. A. McCormack is superintendent.——Monroe Harman, manager of the Ruby mine, on Mount Chopaca, Okanogan county, reports the pay-shoot on the lower tunnel level to have been exploited 20 ft. in length and 50 ft. in height. The rich pay-streak averages 20 in. in width, and a lower grade shoot which overlies it, next the hanging wall, is five feet in width, and will pay to ship as soon as railroad transportation is available. The raise on ore is 5 by 7 ft., and has separate compartments for ore-chute, a manway and a timber-slide. The water in the face of the lower tunnel is 12 in. wide and 6 in. deep, which will necessitate cutting the drainage ditch deeper. The flow has not decreased since the water was tapped. Should it increase in volume upon driving the drift ahead, it will be used to generate electric power for working the mine.

The Eureka, Alpha and Omega claims, belonging to the Gold King Mining Co., on Belcher mountain, have been bonded to the Bortle Copper-Gold Mining Co., in which D. F. Anderson, president of the Belcher Mining Co., is said to be largely interested. The Gold King claims are believed to carry the apex of the Belcher vein.

Republic, Feb. 24.

The Advance Mining Co. has nearly completed driving an 800-ft. tunnel on its property eight miles south of Daisy, in Stevens county.

King County.

The contract for a smelter at some place between Seattle and Tacoma by the Copper-Lead Smelting Co., in which J. Furth, J. H. McGraw and J. A. Moore, of Seattle, are interested, was let on Feb. 12 to the Union Iron Works, of San Francisco. H. Haas, consulting metallurgical engineer for the Union Iron Works, who has been in Seattle for some time, concluded the negotiations. He says that actual construction of the plant will be commenced in June, and the total cost will be more than $1,000,000. The smelter will have a daily capacity of 1,000 tons of copper ore and 500 tons of lead ore, and will be the largest plant west of Anaconda. The plant will consist of a copper-converting plant, a 50-ton copper refinery, a 50-ton lead refining works, a 50-ton gold and silver refining works, a 500-ton stamping works, a 250-ton roasting plant for the treatment of flue dust, and a flue chamber 1,000 ft. long, with a cross-sectional area of 1,000 sq. ft., terminating in a stack 20 ft. diameter by 250 ft. high, in addition to the smelting capacity for copper and lead. The blast-furnaces will be mechanically charged. The latter will be completed by January, 1907, and the copper refinery during 1907.

Lincoln County.

A. O. Hellen, of the Hellen Mining Syndicate, reports that the 40-ton crusher and concentrating plant is now on the ground on the Swank, near Cle Elum.——The Washington Quicksilver Co. has arranged to build a wagon road to its property near Cle Elum. When this is completed a 50-ton reduction plant will be put in.

Okanogan County.

A. M. Wehe, of the Golden Gate mine at Wehesville, is running a tunnel on the ledge.——The Multnomah Mining Co. has cut a third ledge in running its tunnel a distance of 765 ft. The tunnel will be continued to the Multnomah ledge.

Stevens County.

John Keough has contracted to purchase the Anaconda and Copper King properties on Fish creek, northeast of Northport. The contract requires that not less than eight men be put to work immediately.——The Silver Queen Mining Co., of Spokane, lessees of the Silver Queen group, two miles south of Kettle Falls, is sinking a shaft.——The owners of the Daisy mine, at Daisy, 25 miles south of Kettle Falls, are planning to put in a concentrator.——The Jupiter Lead Co. is running a tunnel at the Jupiter lead mine, seven miles east of Northport, to strike the vein below the old workings for draining and more advantageous working. Sinking from the upper workings is also in progress.——Operations have been resumed at the Sunset mine, near Northport, after a shut-down of two months.——The owners of the Hecla mine, near Northport, will put in a concentrator and resume operations on a larger scale.——The owners of the Zodiac mine, on Sheep creek, west of Northport, have their crosscut tunnel in 600 ft. and are expecting to reach the orebody soon.——Abram Bros. began sinking last week on a vein in their property near Northport.——The owners of the Pearl Consolidated are drifting on the 200 level of their mine near Northport.

The Oversight Mining & Milling Co., of Seattle, has installed a three-drill compressor on its property on Belcher mountain, near Northport. A tunnel is now being run on the foot-wall of the main ledge and another on a ledge recently found.

Whatcom County.

C. E. Sheppard, representing the creditors of the Nooksack Mining Co., of Nooksack, bought in practically all of the company's property, for $9,598, at sheriff's sale a few days ago.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Official figures of the British Columbia Copper Co.'s Greenwood smelter for the year 1905 show the amount of ore treated to be 210,830 tons, the amount of custom ore received being 16,357 tons, the balance coming from the company's Mother Lode mine at Deadwood. The Mother Lode mine shipped during the year 174,567 tons, the difference between tonnage smelted and tonnage of ore received being made up of material other than ore, such as flue dust from storage, and in the reduction of ore stock.

The Dominion smelter at Boundary Falls is treating about 700 tons of ore daily.——The Granby Co. have taken a working bond on the Pathfinder group on the north fork of Kettle river.——A drift on the 350-ft. level of the Brooklyn mine cut an orebody which had been lost in the upper workings.——The Granby Consolidated is five years old. The first ore shipped from the Granby mines was in July, 1900, and since that time 2,258,458 tons of ore have been shipped and treated at its smelter, as follows:

	Tons.
1900 (six months only)	64,538
1901	231,762
1902	309,858
1903	393,718
1904	549,703
1905	653,889
1906 (January)	74,995
Total	2,278,458

Its smelting capacity is now 2,700 tons per day. It has one of the best equipped and most economical copper-smelting plants in the world. In 1905 a recovery of 26 lb. of copper per ton of rock was secured.

ONTARIO.

A rich find of gold in quartz is reported from the Laurentian mine, near Dinorwic. Prospecting is being done with a diamond drill.

MEXICO.

Coahuila.

The Mazapil Copper Co., of Saltillo, is planning a long tunnel from Concepcion del Oro, in Zacatecas, to the Aranzuzu copper mines.

Durango.

It is reported that the American Smelting & Refining Co.'s smelter at Velardena will not be ready for blowing in before July. The concentrating mills and plant have been increased in capacity. Trams and ore-carriers have been installed and the power plant improved. The smelter will have a daily capacity of 2,000 tons. The Chihuahua smelter, work on which has been commenced, will be ready to blow in within a year. It will start with a capacity of 500 tons of ore, to be increased in accordance with the demand.

Los Marches Mining Co. has completed the installation of a concentrator at Inde. The furnaces at the new smelter will be blown in during March.

Mexico.

The Borda Antigua Mining Co., located at Tlapujahua, is running its mill and concentrating plant. The estimated tonnage of the upper Antigua workings is about 30,000, with a value of $5 to $10 gold per ton. The manager of the property is Jose Luis Requena, president of the Dos Estrellas Company.

Oaxaca.

It is announced that the new Oaxaca smelter, at Magdalena will be ready to blow in by April 1. The plant will have an initial capacity of 75 tons per day.

Sinaloa.

The Tajo mines, near Rosario, have been shut down to permit reconstruction of the mill. A cyanide plant will be substituted for the amalgamating plant. It is reported that the plant will have a capacity of 250 tons per day.

The Compania Minera Guadalupe de los Reyes will instal a 5,000-h. p. hydro-electric plant to furnish power for its mines near Cosala. R. McF. Doble of San Francisco, Cal., is drawing up the plans. —— The electrical machinery for the mines of the Compania Minera de Panuco, near Concordia, has arrived.

Sonora.

A small smelting plant is being erected by the Santa Ysabel Mining Co., 25 miles south of Nogales, Arizona.

The Giroux Consolidated Mining Co., of Capote, is receiving machinery for a reduction plant, including a 60-ton smelting furnace and a 10-ton stamp-mill. Both amalgamation and cyanide processes will be used.

NOVA SCOTIA.

Queens County.

The Brookfield mine—the deepest, and in the past one of the most productive mines of the province—has been closed, the reported reason being unwarranted interference of an organization known as the Lord's Day Alliance, which objected to work being prosecuted on the Sabbath.

Personal.

S. F. PARRISH is at La Jolla, California.

W. M. CLARK, of Guanajuato, is visiting Denver.

F. L. BOSQUI has returned from Goldfield, Nevada.

OTTO SUSSMANN, of Salt Lake City, is in New York.

C. E. BORTLE, of Republic, Washington, is in the East.

M. D. SCHRIBNER, of Tombstone, Ariz., is at the Palace.

C. H. MUNRO, of Portland, is about to proceed to Alaska.

F. W. BRADLEY and MARK L. REQUA are at Ely, Nevada.

R. GILMAN BROWN has returned from Ymir, British Columbia.

THOS. H. LEGGETT has returned from Mexico to San Francisco.

MARK B. KERR has returned to Tonopah from San Francisco.

J. HERBERT CURLE is in Florida. He will proceed shortly to Japan.

A. A. TALMAGE, of the Blaisdell Co. of Los Angeles, is in Mexico City.

THOS. B. STEARNS, of Denver, is taking a short holiday at New Orleans.

FREDERICK H. HATCH is returning from the Rand, to reside at London.

CHARLES JANIN is on his way to London, to take a well-earned holiday.

D'ARCY WEATHERBE has arrived in San Francisco from British Columbia.

FREDERICK LYON is in San Francisco from Kennett, Cal., at the St. Francis.

NEWTON B. KNOX has joined the staff of Bewick, Moreing & Co., London.

J. OBALSKI has been appointed director of mines for the Province of Quebec.

B. F. EDWARDS, of the West End Mining Co. of Tonopah, is in San Francisco.

MALCOLM L. MACDONALD, of Tonopah, came to San Francisco for a few days.

CHARLES A. MOLSON is examining the Nevada Consolidated copper mines at Ely.

WILLIAM N. CUMMINGS, of Guanajuato, is examining mines at Silver Peak, Nevada.

W. P. RUTHERFORD has returned to London from an examination of mines in Japan.

D. A. FREEMAN, of Los Angeles, who is mining in Mexico, is visiting San Francisco.

L. H. JANSEN, of Kansas City, visited San Francisco on his way to Western Sonora, Mexico.

P. A. MCCORMACK is superintendent of the Phil Sheridan mine, at Sheridan Camp, Washington.

J. TROWBRIDGE BAILEY, of New York, is investigating the dredging industry at Oroville, California.

JOHN ROSS, JR., of Sutter Creek, and E. L. DAVIS, of Telluride, Colorado, are visiting San Francisco.

ALBERT LADD COLBY has opened an office as iron and steel metallurgist at 477 Central Park West, New York.

STEPHEN C. THOMAS has returned to Sutter Creek after having been in charge of the Caribou mine in Nova Scotia.

ROBERT C. GEMMELL has been appointed general superintendent of the Utah Copper Co.'s mines, at Bingham.

C. B. LAKENAN has gone to Philadelphia, whence he will proceed to Panama to report on some placer mining properties.

F. E. FIELDING has recently opened an office at 201 Henne Bdg., Los Angeles, Cal., which is run in conjunction with his office at Reno, Nevada.

EMERSON GEE returned to Los Angeles for a few days after a stay of five months on the west coast of Mexico. He will be at Culiacan, in Sinaloa, for the next three months.

R. S. RAINSFORD, of Salt Lake City, has left the employ of the Guggenheim Exploration Co. to become field engineer for the American Smelting & Refining Company.

THEODORE DWIGHT has resigned as assistant secretary of the American Institute of Mining Engineers and has become president of the Mineral Development Company, owning mines in Mexico.

THOMAS L. WILKINSON has resigned the position of assistant general manager and engineer of the South West Smelting & Refining Co., of Jarilla Junction, New Mexico, and has returned to Denver to resume his individual practice.

C. G. WARNFORD LOCK has just returned to Singapore from a three months' tour of inspection and exploration in Kenaman, one of the independent native States of the Malay Peninsula, and has since been engaged in reporting on tin mines in the neighborhood of Raub.

CHARLETON, DICKINSON & CO., mining consulting engineers, of 353 Mansion House Chambers, London, announce that they have arranged with Mr. Lock to act as their representative. Mr. Lock has opened an office in Singapore, and Messrs. Charleton, Dickinson & Co. have arranged to represent Mr. Lock in London.

Latest Market Reports.

SAN FRANCISCO, March 1, 1906.

ANGLO-AMERICAN SHARES.

London, March 1, 1906.

	£ s d		£ s d
Camp Bird	1 8 0	Oroville Dredging	0 19 4½
El Oro	1 5 3	Stratton's Independence	0 7 9
Esperanza	4 6 3	Tomboy	1 6 3
Dolores	1 18 8		

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. March 1, 1906.)

Amalgamated	$107¼	North Butte	$ 84½
Anaconda	265	Old Dominion	45½
Bingham Copper	42½	Shannon	6⅝
Calumet & Hecla	665	Tennessee Copper	44
Daly West	14⅜	Tonopah-Nevada	18¼
Granby	99⅝	United Copper	68¼
Greene Consolidated	27½	United States	55¾
Nevada Con. Copper	15¾	Utah Copper	31½

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 35	Ophir	$5 75
Hale & Norcross	1 15	Potosi	0 12
Mexican	1 20	Savage	0 42
Exchequer	0 55	Yellow Jacket	0 11

[Tonopah and Goldfield.]

Belmont	$4 90	Montana-Tonopah	$2 97½
Golden Anchor	1 45	Ohio-Tonopah	0 60
Jim Butler	1 35	Red Top	1 90
Jumbo	1 50	Sandstorm	1 42½
Kendall	0 89	Tonopah Ex	10 00
Midway	2 30	West End	2 50

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 66⅜c. per fine ounce; San Francisco, 66¼c.; London, 30½d. (standard ounce, 925 fine); Mexican dollars, 52@54c., San Francisco; 51½c., New York.

COPPER.—New York (by wire, average for week ending March 1), Lake, $18.37@18.50; Electrolytic, 18.12@18.37c.; Casting, 17.75@18c. per pound. Mill copper plates, $21; bars, 21@24c. London: £78 spot per ton.

LEAD.—New York (by wire, average for week ending March 1), $5.35 per 100 lb; San Francisco, pig, 5.70@6.60c. per lb.; pipe 8@8½c.; sheet, 9@9½c.; London: £16 2s. 6d. ℔ long ton.

SPELTER.—New York (by wire, average for week ending March 1), $6.05@6.10 ℔ 100 lb.; London, £25 17s. 6d. ℔ ton; San Francisco, ton lots, 7c.; 100-lb lots, 7¼c.

TIN.—New York, pig, $36.15@36.35; bar tin, ℔ lb., 42½c.; pig, 39c. London, £165 10s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, nominal, $20@25 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$41.50, large lots; London, £7 7s 6d.; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 35@38c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35; gray forge, $17.85; San Francisco, bar, 3½c. ℔ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.00 open hearth billets, $28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8½c.; less than 500 lb., per lb., 8½c.; in 25-lb. tin pails, ½c. ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ½c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8¼c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 16c@17c; San Francisco, 1000-lb. lots, 16c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8½c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11½c; 14 oz., 10@10½c; 12 oz., 9½@9½c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3¼c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6½@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

COAL.—San Francisco, coast, yard prices to dealers: Wellington, $7.50; Seattle, $6.50; Coos Bay, $5.50; Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $14.00; Cannel, $8.50; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

Commercial Paragraphs.

OFFICE of the Empire Consolidated Mining Co. of Searchlight, Nev., is now located at 201 Henne Bldg., Los Angeles, Cal., late No. 402 Douglas Block.

THE Union Gas Engine Co. shipped a 30-h. p. 'Union' double-cylinder stationary engine to the Ruth Pierce Mining Co., Hornitos, California. The engine is fitted to run on distillate and crude oil.

THE A. Lietz Co., manufacturers of high-grade surveying, engineering, mining and nautical instruments, announce the removal of the factory, main office and show rooms to their new four-story brick building, 632 and 634 Commercial street, San Francisco. They have a branch salesroom at 207 Montgomery street.

THE Tallapoosa Gold Mining Co., Yates, Ala., have bought from the Allis-Chalmers Co., Milwaukee, machinery for a five-stamp cyanide mill with steam power, for installation at Alexander City, Ala. The Alaska-Treadwell Gold Mining Co., Treadwell, Alaska, recenlty ordered a 20x48 double-drum, direct-acting hoisting engine from this firm.

THE Lima Locomotive & Machine Co. of Lima, Ohio, report that the Duluth, Virginia & Rainy Lake Railroad Co., Duluth, Minn., has placed an order for one 65-ton Shay locomotive; L. B. Walling, Victoria, Fla., has placed an order for one 15-ton Shay locomotive; Sumpter Lumber Co., Sumpter, Ala., has placed an order for one 37-ton Shay locomotive.

THE General Engineering Co. has been incorporated under the laws of Utah, with offices in the Dooly Block, Salt Lake City, Utah. The purpose of the company is to do a general mining, metallurgical, civil and mechanical engineering business. J. M. Callow is president, J. W. Neill vice-president, F. E. Johnson secretary and treasurer, and in addition to whom are G. M. Bacon and F. P. Callow, members of the staff. Milling, concentrating and other metallurgical tests will be made on ores in 100-lb. lots.

THE new ore-testing plant of the Colorado Iron Works Co., erected at its works in Denver, is kept constantly busy on lots of ore that come from many parts of the world. The equipment includes stamps, crushers, rolls, impact screens, concentrating tables, amalgamating plates, cyanide leaching vats, classifiers for separating sand from slime, and a well-equipped chemical laboratory. The company recently received and are filling the following orders: Four sets of 48 by 24-in. belted rolls and two sets of 48 by 24-in. geared rolls for the American Smelters Securities Co.; a 42 by 120-in. coppermatting furnace, for the Utah Smelting Co., Ogden, Utah; a 42 by 150-in. copper matting furnace, with accessory equipment, for the Great Western Gold Co., Shasta county, Cal.; one matte tramway, with settling bowls, special electric hoisters, sixteen 8-ft. self-dumping slag trucks, and five 35-ft. screw-dump slag-trucks for the Compania Minera Fundidora y Apinadora, Monterey, Mexico.

Trade Treatises.

'Petroleum Lubricating Oils' is the title of a neat little brochure issued by the A. W. Harris Oil Co. of Providence, R. I. It describes, with illustrations, the various grades of lubricator made for numerous purposes by this firm.

The F. M. Davis Iron Works Co., of Denver, has issued Catalogue No. 37, Ore Milling Machinery; No. 38, Smelter Machinery, and No. 41, Hoisting Machinery; No. 43, The Ferraris Ball Mill. These will be sent on application to the company.

'Concentration' is the title of the latest trade publication of the Joshua Hendy Machine Works, catalogue No. 17. It is a work of art typographically, and contains much valuable information on the art of concentration, and is devoted particularly to a description of the Pinder concentrator and its operation.

Books Received.

'Proceedings of the American Forest Congress,' by the American Forestry Association, is a volume of 474 pages, which deals with forestry conditions in the United States, and with forestry is related to irrigation, the lumber industry, grazing, the railroads and mining, and contains much of value to all interested in the lands of the public domain.

Obituary.

CHAS. SMITH, who for many years has been a millman at Mother Lode mines, died at Pine Grove, Amador county, on February 23.

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SAN FRANCISCO, MARCH 10, 1906.

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EDITORIAL.

OUR contemporary, the *San Francisco Chronicle*, publishes a budget of mining news each Monday. This week there is a paragraph which is worth repetition for its cynical humor—whether intentional or not, we do not venture to say. It is stated that control of a certain copper mine in California has passed "to the American smelting trust, one of the subsidiary organizations of Amalgamated Copper and Standard Oil." The last sentence is one of those statements which are labeled "important, if true." We doubt, however, whether the Guggenheims are subsidiary to anyone at the present time, they give no signs of subsidence, either local or regional; but our contemporary evidently expresses a fear, which has grown of late, and which we share, that the big industrial combinations appear bent on a co-operation which cannot but be hurtful to the community, more especially those engaged in mining and smelting, by the creation of a huge monopoly prejudicial to anything like legitimate competition.

COBALT, in Ontario, is already the scene of the rush that was expected this spring, and that celebrated silver-nickel-cobalt camp is sure to attract further attention among mining men. The article by Mr. D'Arcy Weatherbe, of our staff, is timely and those who read it will obtain information likely to prove useful, especially if they contemplate contributing their presence to the local excitement. Our Toronto correspondent also gives later news from this part of the continent and describes the efforts recently made to improve mining regulations in the Province of Ontario. It is apparent that the legislature has awakened to the growing importance of the industry and means to give fair treatment to those who, whether as prospectors, engineers or capitalists, are likely to take part in the development of Ontario's undoubtedly extensive mineral resources. The arrangement to throw open the timber grants is a step in this direction; those who are well informed expect it to be the precursor of further finds of valuable ore in Temiscaming.

WE have been favored with an authoritative account of the great cantilever bridge across the Victoria Falls, of the Zambesi. Our readers will find it interesting. The height of Niagara is 158 feet, while that of the Victoria Falls is 420 feet; the width of Niagara is about half a mile, while that of Victoria is twice as much, so that this manifestation of natural energy must be greatly impressive. The bridge is important as affording a crossing to the railroad, which will stimulate the development of northern Rhodesia and central Africa in general.

THE market for South African shares, known at London as 'Kaffirs,' has suffered a collapse, such as would have been considered quite impossible a few years ago. Rand Mines, a consolidation of interests in a number of the richest mines on the Rand, has been quoted at £5⅛ this week, as compared to £13½ at the time the Boer war ended. This represents a strong reversal of financial sentiment, for Rand Mines has long been considered the "consols of South Africa," an investment that could not be moved though the heavens fell. The drop in Kaffirs means a loss of millions sterling, because however much of the present depression may be due to a feeling of panic over possible political developments, which may not in the end prove as hurtful as supposed at the moment, it is certain that confidence in the best of the South African mining shares as a non-speculative investment has been shattered beyond any mending. This will tend to lessen English participation in mining, because it has undermined the confidence of investors; but in the end, and before long, it will have the effect of diverting British money to other mineral regions.

FROM London we get our usual news-letter, and this week it is particularly interesting. To our Cornish friends it will be like a message from home to read of the mining revival in the 'old county,' this development being due to new discoveries of tin ore at Wheal Grenville mine, as well as at the 'old reliables,' Dolcoath, Carn Brea and Tincroft. The mining terms used by our correspondent, himself deeply versed in such matters, will be familiar to Cornishmen, while to others they will serve as a reminder of methods which long antedated the discovery of gold either in California or Australia. The 'cost book' system is based on the idea of partners who divide profits and share losses each month; the shareholders are called 'adventurers' in the sense in which Raleigh, Drake and Hawkins were adventurers, that is, they ventured forth into the unknown seeking either territory, gold or sport. The 'call' is an assessment, the 'bal' is the mine, the 'sett' is the ground under lease, 'black tin' is tin oxide (cassiterite) in distinction to the metal itself. The 'streamers' are the men who work the stream tin, the alluvial deposits, partly natural, partly the tailing from the mills or 'dressing floors.' When it comes to the 'Lord's dues' our readers may suppose that the tithing system or a contribution to the church is indicated. No, it is the rent payable to the landlord or owner of the claims, that is, the territory exploited by the mining company. Our Cornish friends still measure in fathoms, and not in feet as we do, indicating their larger ideas of exploratory work; for it is true in mining more than in any other field of activity, that those who seek are those that find.

THE article drawing attention to Job as the first writer on ore deposits will cause a flutter among our friends at Washington and New York, who had good reason, until now, to consider themselves the real thing in that branch of knowledge. But they grow haughty sometimes and deprecate the investigations of the less learned, therefore this new reading of the prophet of the land of Uz will be appreciated by our readers. It is obvious that the writer of the article is deeply learned in things holy and unholy, but he has overlooked a more recent communication from regions usually known only by hearsay. In that strange epistle to the Nevadans known as 'The Geology of Jell,' by a prophet who is not without honor in his own University, there is disclosed the innermost workings of Plutonic activity. We shall quote from it next week. The traveler from the deep, who knows a thing or two, says, among other things, that "the various kinds of igneous rocks are produced under the direction of the Jevil-in-Chief, very much as charges are mixed for a furnace. When the Jevil-in-Chief orders andesite, he issues instructions for the proper proportional parts of these ingredients, and the subordinate jevils run them together and over into a spout which connects with the volcanic conduit. Into this and on the principle of the injector, are run under enormous pressure steam and other mineralizers and the whole mixture, boiling and seething, forces its way through the zone of flowage and so to the upper world." But we must not anticipate. The copyright for this communication was printed on asbestos and bears evident marks of genuineness. Our readers will, we believe, feel proud when we put them in possession of both the first and the last word on a subject of such transcendent economic importance.

Smelters and Their Fume.

It is fairly certain now that the Guggenheim interests, otherwise known as the American Smelters Securities Corporation, will build a large copper smelter in the vicinity of San Francisco. The size of the plant is yet to be determined, but it is not likely to include a refinery; that last stage of the metallurgical process will be completed at Tacoma, where a refinery exists already. The northeastern end of the Bay of San Francisco has been the favorite site for smelters; the Selby works, the Copper King plant and the new Mountain Copper smelter having been erected along that shore of the Sacramento estuary. This locality is near the trans-continental track of the Southern Pacific Railway, of the Oregon and northern California branch line and, latterly, of the Santa Fe railroad. But the farmers have a habit of getting busy with damage suits in that part of the country and poor looking horses are found to increase in value when they eat smelter fume, so that such practices have become irksome to the smelter managers and this important industry now fights shy of Port Costa, Benicia or Martinez. It is understood that the new plant, a large copper smelter that will supplement the Selby lead reduction works, will be erected on the southwest shore of the Bay, at Point San Bruno, in San Mateo county, about six miles south of the city of San Francisco. The prevailing winds, for nine months in the year, are the westerly trades, so that the smelter smoke will drift across the water, here four to five miles wide, and in its crossing be rendered harmless to even the most susceptible cow. Speaking of smelter fume, we note

that the United States Circuit Court of Appeals has reversed the decision whereby an injunction was granted against the Mountain Copper Company, at Keswick, in Shasta county, California, on the ground that "the acids generated by the smelting works were injuring Government property." Two of the judges decided that it was contrary to public good to stop the operations of a large industrial establishment in the interest of the owner of 4,000 acres of granitic territory, worthless for agriculture, and already deforested. Judge Hawley, the minority, pronounced the dictum that "the innocent are not to suffer either in their property or comfort for the promotion of another's interest or profit." And this idea is undoubtedly at the base of all blackmailing suits brought against the smelters. They are always willing to buy land or compensate the owners of it when such land comes within the radius of their smoke nuisance, but they are not allowed to treat such cases equitably; on the contrary, they are put in the position of enemies of the public good. We regard the smelters as representing a beneficent industry, the wellbeing of which is essential to profitable mining; and in taking this view of them we disregard the financial schemes involved in their organization and the speculative share market which some of them afford. As the promotions of clever financiers they do not interest us, they are able to take care of themselves, but as an integral part of the vast operations by which the mineral resources of the country are exploited, it does appear to us that they should not be hunted from pillar to post by blackmailing pseudo-farmers who trade on the notion that a ranchman is a benefactor and a smelterman a criminal. The greatest good of the greater number is the aim of intelligent government; a right of way for a railroad can be obtained through another's land by proper legal proceedings, a city can extend a street by condemnation suits and, in general, the individual who obstructs a development conducive to the public benefit is politely told to be reasonable, and, eventually, compelled to take fair compensation. Fair compensation the smelters have always been willing to offer, unending blackmail they have fought. It would be to the injury of our community and of the State of California if the idea should prevail that a people whose existence was founded on mining has made up its mind to treat all smelting works as a public menace.

Wanted—A Wake.

We might have called for a funeral, only that would be too depressing, while an Irish wake with its mournful features enlivened by a bibulous accompaniment and the recitation of the deeds of the dear departed, just fills the needs of the occasion. Besides, at a wake the corpse has been known in rare instances to come to life again. We refer to the proximate end of the Royal School of Mines, London.

We have received a copy of the final report of the Department Committee appointed to consider what changes were necessary to give greater usefulness to the Royal College of Science, "including the Royal School of Mines." By the same mail comes a copy of our contemporary *The Mining Journal* giving an account of the recent School of Mines dinner at which a presentation was made to Professor John W. Judd, on his retirement as dean of the School. On that occasion the alumni and their friends united to do honor to one who, as teacher and as author, stands among the great men of geologic science; his retirement coincides with the approach of a new era and it is no wonder that the speakers at the dinner all expressed, in varying phrases, the hope that the Royal School of Mines may not be absorbed by any other institution. Having read the Committee's report and knowing something of the cross-currents that stir the lethargy of British interest in mining education, we have a profound and heartfelt regret that the School identified for over half a century with so much that was brilliant, honorable and useful should finally fall into the maw of a nondescript agglomeration.

The committee recommends that there be established an "institution or group of associated colleges, of science and technology," "to include the work of the Royal College of Science, the Royal School of Mines, the Central Technical College and departments to be established on the additional site at South Kensington." Thereupon arises the question, so the committee says, "What should be the relation of the new institution to the University of London?" but this matter is held in abeyance, with ominous signs of being decided in the affirmative; that is, the new institution is likely to be incorporated in the University of London.

And so one of the great schools of mines will be finally destroyed. It is all well enough to speak of improved facilities, larger schemes and the retention of the degree; but when you change the lock and barrel of a gun, even if the stock remains, you have lost the old weapon. We have no patience—and do not apologize for it—with the stupid neglect and final emasculation of the only mining school in the British Empire that has any traditions enabling it to rank with other places of its kind in Europe or America. The Royal School of Mines was started to train geologists and mining engineers fifty-five years ago, and it has numbered among its graduates men of rare usefulness. In 1879 it was moved from Jermyn street to South Kensington, and became part of an institution for training science teachers, the change proving highly injurious to the individuality and identity of the original establishment. Nevertheless, there was a good deal of college spirit at South Kensington, and an excellent training was obtained from a corps of teachers, many of whom had worldwide celebrity, and were not only effective lecturers, but great men. Now, not content with the blunder of grafting the old school onto a nondescript teachers' seminary, it is to be annexed to an industrial academy and finally to be absorbed by a mushroom university. It is stupid to make comparisons with Columbia University and its School of Mines; that university is a century older than its mining school; and the latter gains by the association. The scheme outlined at London is more like a proposal to join the Columbia School of Mines to New York University and to agglomerate both with a Brooklyn business college.

Sentiment apart—and sentiment is a power for good even in these money-grubbing days—we hold that the usefulness of the School is destined to be crippled by the new departure, because the special training will be swamped amid the diverse curriculum of the proposed institution; it cannot afford the spirit of a school intended to train professional men, and it will not attract the teachers that a smaller better-defined technical college does. As between the theoretical, scientific instruction of the big universities and the practical training of a provincial school of mines, there is need for an establishment combining men possessed of the highest ability to exposit science, with the instruction that can be given only by the men who have actually done the work of the engineer, and experienced the difficulties that the mining student is destined to face. That combination is attainable at a concrete school of mines and not within the wide-spread boundaries of a technologicum that can never appeal with any force to the support of the profession.

This British effort to create a grandiose Charlottenburg is as far as the poles asunder from the ideal of a small school of mines, receiving graduate students from other universities and colleges where a preliminary scientific instruction has been obtained, reserving the special training for the School of Mines itself, with a separate identity, noble traditions, a few first-rate teachers, supplemented by occasional courses of lectures from experienced engineers, the whole cemented and quickened by professional solidarity and enthusiastic support. The day has come, assuredly, when we ought to realize that mere bigness does not count for much in an educational center; unrestrained annexation produces only the jelly-like shapelessness of the lower forms of animal life and complex organization wearies itself out with red tape and departmental delays. It is a pitiable thing that an Empire which controls two-thirds of the gold production of the world and a financial center like London, holding the financial reins of a mining industry, the output of which is measured by the revenue of one or two continents, should be able to do no better than this—to smother the school of Ramsay and Tyndall, of Percy and Smyth, of Huxley and Judd, between the folds of an inflated kindergarten. If it be carried out to the bitter end, we look for an increase in the number of men, already not inconsiderable, who will enter at the mining schools of the United States.

By the Way.

In *Popular Science Monthly*, Mr. A. C. Lane, State Geologist of Michigan, makes some sound observations. He says:

The youth of a people is in reality like that of a man, full of hope, extravagant, feeling boundless resources and inclined recklessly to squander them in attaining the objects of desire. If it is wisely guided, age may bring riches which are not merely in prospect, but in possession, which are the fruits of useful industry. Unwisely guided, age may bring the exhaustion of the resources thought to be boundless, with nothing worth while to show for them; and as the individual man may be found bankrupt in purse and pride, so the nation or community may suddenly find its supposedly inexhaustible supplies exhausted, the fabulous fertility of its fields failing, its hills once clad in forests naked and seamed and gashed by gullies until they remind one of the beggar's clothes whose spendthrift habits have dragged him down to like depths of destitution.

Mill says that "looking on the world as not only the home of man, but as subservient in all its phenomena to the welfare of the human race, we may consider the development of any region to mean such treatment of its natural resources as will enable the land to continue to support an increasing number of inhabitants," and ventures the suggestion that "fortune hunting is inimical to development in its true sense. A fortune acquired through production or speculation can usually be made by only a few individuals and almost always entails the exhaustion of natural resources or the lowering of wages; a prosperous livelihood, on the other hand, can often be secured to a multitude without permanent impoverishment of the land." The former statement we may consider a fair definition of development of a country. The latter is one of those general statements which are hard to disprove, being both vague and qualified. But it suggests that there may be such a thing as improper development. Much talk and writing seem based on the theory that development is always and only good—is a good in itself. This we may fairly question.

In the first place, note that the development of national resources does not in all cases imply consumption. It is true that one can not eat one's cake and have it too, but it is also true that one can use a house, see a picture, and gaze at a statue, and they be none the worse for it. Italy and Greece are vastly wealthier to-day than they would have been had the marbles of their statues remained in the quarries of Pentelicos, Paros or Carrara.

As a second class we have the resources of which there is a continuous and transitory supply, in contrast to those of which there is a stock, in the using of which we are drawing on an original supply or the accumulation of generations. The farmer's windmill in using wind power is using a resource of the former class, while the use of coal is drawing on a reserve. Farm products so far as they are due to air, water, sunshine and hard work, the minting of golden sunshine into golden grain, are a development of resources continuously supplied, but there is also a little ash or mineral matter which, if not replaced by manure or fertilizer, is a draft upon the capital of the commonwealth. Most important perhaps of these resources is water power, which is indeed largely used, but of which there are millions of horse power yet unused. Any permanent substantial dams which may help us to utilize this will be a permanent gain to the resources of the State.

Third, are the resources which are wasting away in the use. As we gaze on a piece of soft coal across the cleavage, we shall see dozens of alternating bright and dull bands in an inch. Each of these may represent an annual or semi-annual change of climate, and a ton of coal may represent 30 tons of wood. Thus in using coal we are dissipating in a few years the accumulations of generations heaped up millions of years ago. Now of these reserve accumulations, and I can not emphasize the fact too strongly, there is never an inexhaustible supply. People a scant half century ago used to talk of the inexhaustible supplies of pine in the Saginaw. There is now hardly a stick standing. Men prate of inexhaustible mines. There are no inexhaustible mines. The bottom of perhaps the greatest mine in the world, the Calumet & Hecla, on its conglomerate is much too visible. The Spindletop bubble has already burst, and its wealth has practically vanished, wasting what should have been the industry of a generation in a scant decade. The towns that had natural gas no longer burn it in flambeaus that burn millions of cubic feet a day, but charge 20c a thousand for it. Of course sometimes the supplies are in a way practically inexhaustible. The salt of Michigan, if the present rate of production of two billion pounds a year is not too greatly exceeded, might probably last some two million years. Yet the consumption will increase—we know not how much, and a much less time and amount would threaten the collapse of Detroit beneath Lake Erie. They talked only a few decades ago of inexhaustible supplies of iron ore; at the present rate of consumption of some 23,000,000 tons a year, there is probably enough for 80 years' consumption. Still, that is not a very long time in the lifetime of a nation.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

IN electricity a watt is one ampere flowing at a pressure of one volt.

ALL KINDS of nitro-glycerine powders may properly be called dynamite.

ARAGONITE is a natural precipitate of calcium carbonate from springs.

IN mill screens No. 7 slotted screen is about equivalent to that known as 30-mesh.

CROSSHEADS for sinking buckets in shafts are now made provided with safety clutches.

THERE are several varieties of asbestos, of which mountain leather, a sheet-like variety, is one.

HOISTING ROPES will not endure well if passed over sheaves or wound on drums of small diameter.

IN June, 1899, the price of copper was 18½c. per pound, only a fraction of a cent below the recent high price.

NO SHAFT in which cages or skips are to be run is safe without substantial timbers to carry the guides.

IF the transit is out of adjustment, it is the better plan to send it to the instrument-maker for re-adjustment.

NO MINE SAMPLE is of value which is not representative of the vein at the place where the sample was taken.

THE Supreme Court of California has decided that where an error in the date of a location has been made the facts in the case control.

EACH miner's inch of water under 1,000 ft. head will develop, theoretically, 2.4 h.p. Therefore, 1,000 in. will give approximately 2,400 horsepower.

LIMESTONE is calcium carbonate, often rendered impure by admixture of clay and sand. When containing carbonate of magnesia, the rock becomes dolomite.

WHERE large quantities of gravel or broken rock are to be moved 1,000 ft. or more, it is usually good business to lay tracks and move the material in trains drawn by horses.

A SQUARE ACRE of land measures 208.7 ft. on each side and contains 43,560 sq. ft. In a lode mining claim of statutory dimensions—600 by 1,500 ft.—there are 20.661 acres.

BY 'cap sill' is meant a timber used in the square-set system, which rests at one end in a hitch cut in the foot-wall, the other end resting on a post of the set nearest the wall.

THE alleged absorption of solution by redwood tanks is largely an exaggeration, which is found useful in 'wild-cat' mining when the returns from the cyanide mill are disappointing.

THE courts have decided that mining claims, patented or unpatented, are real property in the strictest sense of the word, and may be taxed, or attached, and are subject to other legal processes.

IT is not advisable to have rock skips made too great a depth, as the impact of falling rock from the chute into the skip wears the bottom very rapidly, particularly if the distance be over five feet.

OXIDIZED COPPER ORES, when rich enough, are commonly smelted, if the necessary fluxes are obtainable. If too low grade to smelt, they may be leached with dilute solutions of sulphuric acid.

UNDER no circumstances should a metal bar be used in tamping powder in a drill-hole. Some States have passed a law making such practice illegal. The chief sufferer is usually the man who uses the metal-bar.

THE cost of producing a pound of copper depends wholly on the mine and its environment. Some mines are so situated as to require high-grade ore to pay. Others can work remarkably low-grade ore at a profit.

WHEN drilling in sandstone the drill-bit should be tapered somewhat and then flattened instead of drawn to a cutting edge. If a chisel-bit is used in drilling sandstone the bit will wear very sharp, and will frequently become fitchered.

THERE are few living streams in the peninsula of Lower California, except in the highest ranges. There are extensive mineral resources, and in several districts mining has been or is being carried on on a large scale. The most noted places are at El Progreso, near La Paz, and at El Boleo, near Santa Rosalia.

CONCENTRATES knows of no mineral veins or ore deposits in that kind of calcite known as onyx, or travertine, and called by some aragonite, though possibly there may be such. These deposits are usually of recent formation, and any vein or segregation of mineral in such deposit is likely to be superficial and of no great extent.

VERTICAL ladders in mines should not extend over 20 ft. without a platform. Where vertical ladders extend for long distances, in cases of emergency, when the men were obliged to climb out of the mine on ladders, instances have been known of a man falling from the ladder upon his comrades below, carrying all to destruction at the bottom of the shaft.

'POT-HOLES' in streams rarely, if ever, prove to be profitable places to mine for placer gold. The probable reason is that gold carried into such holes or depressions is either worn out by the grinding of the sand and cobbles swirled around by the current, or it is carried out of the hole by the rush of the waters. It seems more likely that the former reason is the more rational.

LYDIAN STONE, or basanite, is the touchstone of the jeweler and goldsmith. It is a velvety black stone—a sort of jasper, hard and silicious. Its use is in testing the purity of precious metals, which is determined by the streak made by drawing the metal across the stone making a streak. An experienced workman can form a very close judgment of the fineness of a gold alloy by this means.

FOR fast cutting in drilling, the straight chisel-edged bit is recommended. This style of bit must be carefully tempered, as the cutting is mostly done by the sharp corners, which are likely to be chipped off if there is the slightest flaw. The hammer blows should be sharp and quick. In hard rock a somewhat rounded and rather blunt bit is more economical, though not, perhaps, cutting so fast.

IN returning water from the cyanide annex of a mill to the stamp-battery, it is necessary to be careful about the cyanide in it. The cyanide, if present in sufficient quantity, exerts a selective action on the gold and silver in an ordinary ore; it dissolves the gold and actually precipitates silver on the amalgamating plates. It will also dissolve the copper of the plates and give them a wavy surface hurtful to amalgamation. Not more than five-thousandths or 0.005% cyanide should be allowed in battery water.

WHY a fault-fissure cutting a vein is not also a carrier of valuable ore is difficult to explain. In some instances such crossings, or crossheads, do contain ore, and occasionally they are barren. Those fissures having gangue and other evidences of movement, similar to those found in veins, but destitute of value, are probably of much later formation and may not extend to a depth sufficiently great to reach the zone of deep mineralizing waters which have flowed upward through the ore-bearing fissures.

THE type of riffle used in placer mining and known as the Hungarian riffle is made of strips placed longitudinally in the sluice-box. The slats are secured by stout cross-pieces nailed at each end, with small blocks (two inches long) inserted between the slats near the center to give the whole stiffness and strength. Where the riffle is not longer than six feet, these center blocks are not required. In flumes the Hungarian riffles are made of poles, or scantling, and are sometimes covered with iron to protect the strips from excessive wear. Cast-iron riffles are also in successful use.

HYDRAULIC MINERS say there is a higher efficiency in a single stream of given volume and head from a giant directed upon a bank than when this stream is divided between two giants, under the same head. The common practice is to employ one stream to break down the bank and another to aid in washing away the loosened gravel to the sluices. It is never safe to turn the water into a giant before it is securely anchored. If not firmly anchored it will thrash around, and the lives of all in the vicinity are in imminent danger. A stream from a pipe under 300 ft. is not to be trifled with, and will probably kill a man should it strike him.

SLIME which floats on the surface of the water in vanner-boxes, and elsewhere about mills, may usually be settled by carrying it away from such receptacle through a pipe which is bent downward at the lower end so as to discharge into another box under water. If the pipe be not immersed in water, air is imprisoned in the stream of falling water and slimes pouring into the lower box, and the bubbles of air rising to the surface carry the slime once more to the surface, where it will float again; a baffle-board placed in a settling-tank, which forces the current to pass beneath it, sometimes, though not always, accomplishes the same purpose.

THE first custom smelter in Colorado was built by N. P. Hill at Blackhawk in 1867. It consisted of a calcining furnace and small reverberatory. Every firebrick used in construction was shipped by rail from St. Louis to the terminus of the railroad, and then 600 miles by wagon; all the iron cost 22c. a pound and skilled labor $8 to $10 per day. Smelting charges were $20 to $45 per ton. The matte produced at these works was hauled 600 miles to the Missouri river and then sent by rail to New York, thence to Swansea, Wales, for re-smelting and refining. After being in operation for 20 years at Blackhawk, it was removed to Argo, near Denver.

MANY MINERS, in selecting a site for a tunnel for the development of a mine, make the serious mistake of starting the work too low. It is never good business to start the tunnel too low. While it gives a few feet more 'backs,' this advantage is often offset by the lack of facility in getting the ore into the mill. Where a suitable millsite can be found farther down the gulch, at a point which makes it possible for a tramway to enter the top of the mill at the tunnel level, the tunnel may be run lower than where such millsite is not available. Locate the tunnel, in any event, at such a height that the ore may be trammed directly into the top of the mill or above the rock-breakers.

THE first discovery of gold, which eventually led to the finding of the great Comstock lode at Virginia City, Nevada, was made on May 15, 1850, by a young man named William Prouse, who washed the gold from gravel in a milk pan, near Dayton, at the mouth of Gold canyon. Claims were taken up, and these placers paid $4 to $5 per day to each man, though worked in a crude fashion by inexperienced men. Gold canyon was worked for several years after this, and in the winter of 1858-59 the lode was discovered at Gold Hill by James Finney, popularly known as 'Old Virginny,' after whom Virginia City was eventually named. About the same time Pat. McLaughlin and Peter O'Reilly discovered good diggings on the slope of Mount Davidson—or Sun peak, as it was then called—at the head of Six Mile canyon, nearly two miles north of where Finney had located his claim. The discovery of the McLaughlin & O'Reilly claim led to a much more important discovery of black sulphide of silver in the Ophir claim. Since those days the Comstock lode has produced over $300,000,000, and will probably produce many millions more, as there still remain large bodies of low-grade ore, and possibly also some high-grade ore.

WITH regard to the advantages of ore-bins with inclined bottoms as compared to ore-bins with flat bottoms, it may be stated that with a proper construction of the frame the sloping floor should be amply strong to sustain the weight of the load. The lining of the floor should be of generous thickness, for the stiffness of this part of the structure largely reduces the expense of repairs. Furthermore, the inclined floor should receive a lining of sheet iron, or, preferably steel, under ordinary conditions, but where large quantities of material are being passed through the bins, railroad rails are often employed to furnish a wearing surface strong enough to withstand shock and the abrasive effect of the sliding rock. Such rails are placed side by side lengthwise down the slope of the bottom, the tread of the rail being uppermost. A bin thus constructed, the floor being made to slope at an angle of approximately 45°, will deliver almost any material at the gate and thereby practically empties the bin. The ore that is thus stored is therefore instantly available for use, and can be drawn upon, while with the flat-bottomed bin no ore can be drawn until a sufficient quantity has been introduced to fill up the structure to the angle-of-repose of the material that is being handled, that is, the angle at which the material will run or slide to the gate. Furthermore, if the ore is wet and inclined to stick, the tendency of the inclined bottom is to clear itself, and the packed material is therefore less stable than in the flat-bottomed bin. It will be noted that with the inclined bottom, the angle-of-repose is flatter than with the flat bottom, and the material will run more readily.

UNDER all ordinary circumstances and conditions, 'square-setting' a shaft is preferable to cribbing. The latter is sometimes advisable in soft ground, but not in that which swells upon exposure, for it is likely to crush the timbers unless they are of huge size. In the case of the shaft at Olinghouse, Nevada, if the rock is solid, as described, there is no necessity for cribbing, as the ground will stand without it. The 3-in. scantling being used in the crib—if the crib be solid—will require about 360 ft. board measure to complete 5 ft. of the shaft. If timbered with square shaft sets with 5 ft. from center to center, the two wall-plates, two end-plates and one divider of 8 by 8-in. timber, with a post 6 by 6-in. at each corner, will only require about 180 ft. of timber including blocks, for holding the timbers in place. Lagging may or may not be used, as required. If necessary, use 2-in. plank. In a shaft of the size given this will take about 200 ft. more, if closely lagged—making a total of 380 ft.—only 20 ft. more than are used in the crib, and making a far better shaft. If a pump is to be placed in the shaft, it will require a much more secure support than will be afforded by 3 by 3-in. scantling. It might be a very wise plan to re-timber the shaft from the 110-ft. point to the surface, for the light timber is likely to give trouble and does not make a safe shaft. The 3 by 3's can be used up in many ways, on the surface and underground. Re-timber from the 110-ft. level upward, placing first 'reachers,' resting on hitches cut in the rock for the shaft sets to rest upon. If 8 by 8-in. timbers are employed, the sets may be framed with the 'dovetail,' as in an inclined shaft, which saves some timber and is as good as the overlapping ends when the timbers are properly framed and placed.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—In Mr. Burrows' article on the best shape for a shaft there are two problems presented, in both of which it is proposed to utilize a 10 by 10 ft. shaft already 320 ft. deep.

In the first case, the data are more or less explicit; the shaft is to be capable of hoisting 1,000 tons per day and of handling an appreciable amount of water. In the other case, a quantity is to be hoisted "larger than possible or advisable for two hoisting compartments." Unfortunately, the article does not even approximate *how much* is to be hoisted and one has to guess arbitrarily at the amount.

The question of the probable life of the mine and the richness of the orebody to be served is a factor that enters strongly into the problem of utilizing the whole of the present shaft, and it is quite possible that the saving (if any) to be effected by this may be comparatively so inconsiderable as not to be worth taking into account. In other words, it should be borne in mind that the first point in contemplating a work of such magnitude is to design a shaft that will effect a maximum of efficiency at a minimum running cost when completed and this ultimate object should not be influenced by any "penny wise and pound foolish" policy.

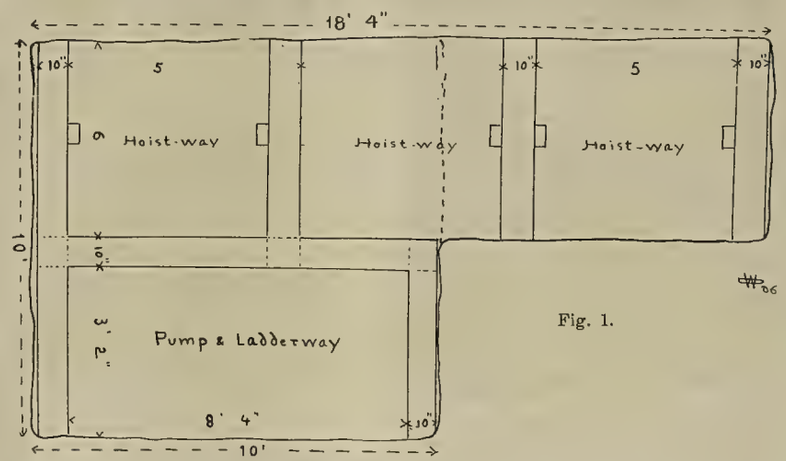


Fig. 1.

Assuming, however, that the old shaft *must* be utilized and considering the first case, it becomes obvious that, partly for the very reasons referred to in Mr. Burrows' article and partly because in a well-equipped and modern vertical shaft with proper platformed ladderway, it is out of the question to hoist and lower material in the latter compartment. The 'jog' idea must be summarily discarded.

It is stated that the old shaft will allow 6 by 10 ft. for two hoisting compartments and 4 by 10 ft. for ladderway and pump. It is hard to conceive of a shaft of such a daily amount of ore to be constructed without properly framed sets, but, admitting that the wall-plates are unnecessary, there remain the dividers and end-plates, which would probably be at least 10 by 10 in. in section. Allowing also for guides 4 by 6 in. and 2 in. for clearance, this, then, would provide only for two hoisting compartments with skips whose greatest possible width would be only 2 ft. 11 in., though, of course, a length could be obtained of 5 ft. or even more. The ladder and pump compartment would then be 4 ft. 2 in. by 8 ft. 4 in. Even using 8-in. timbers, which would not usually be considered adequate for the purpose, the skips (cages would be out of the question) could only be 3 ft. 1 in. wide.

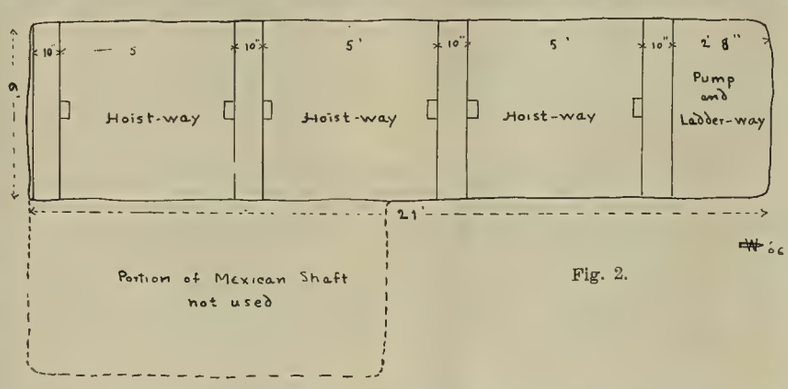


Fig. 2.

At the practical average rate of hoisting these skipways would be inadequate, particularly so, were more than 1,000 tons per day required to be produced. Therefore, the shaft will have to be enlarged, but *how*, is the question. Obviously the 'jog' theory must be discarded. The sketch in Mr. Burrows' article called "manager's proposal," although utilizing all of the old shaft, provides for an unnecessary large sectional area to be excavated. The pump and ladder compartment do not require such a space and with four hoisting compartments there are four separate points of loading and unloading and two hoisting engines, which must be run more or less all the time, thus wasting labor. In solution, I submit two designs. The first provides for the utilization of the whole of the old shaft, and when 320 ft. has been reached the shape of the excavation would be represented by Fig. 1, not a convenient one for either drilling and blasting or removing muck. Therefore, I believe that Fig. 2 shows as advantageous, economical and efficient a shape as can be put forward, and the larger part of the old shaft is utilized.

In both cases, I am assuming that wall-plates are *not* necessary but that end plates *are*. The extra portion to be excavated down to 320 ft. could be removed, either by sinking from the surface or by raising up from the bottom—probably the latter method would be preferable. Here it will be noticed that a four-compartment shaft is designed, with three hoisting compartments and a pump-and-ladderway. The two end hoisting compartments should be amply sufficient for 1,000 tons per day and the extra compartment would be available for an automatic bailer in times of need, which could be readily exchanged for a skip when the ore supply got beyond the capacity of the other two compartments.

It is true that an extra single-drum hoist would be necessary for this compartment, and though perhaps not so economical as the counter-balance engine, which would probably be used at the two other compartments, it is not likely that it would be in use more than a small proportion of the time and there should be no loss in extra labor.

D'ARCY WEATHERBE.

San Francisco, March 2, 1906.

DISTRIBUTION OF ORE.

The Editor:

Sir—The editorial comment upon my first article on 'The Ontario Mineral Belt,'* in which I set forth the influence of the several geologic formations upon the occurrence of the ore in the veins and lodes, and also the cause of the selective deposition in certain beds, makes it evident that some features require explanation. It is thought that the solutions which deposited the mineral in the Ontario and Daly lodes were of different chemical composition from the solutions replacing the limestone in the formation of the bedded deposits. Let us consider first the extensive flat deposits in the 'gray limestone,' which occur irregularly distributed over an area 700 to 1,000 ft. broad and a mile long, in the Daly-West and Daly-Judge mines. The 'gray limestone,' which constitutes the favorable ore-horizon, is 25 to 35 ft. thick and rests upon a floor of quartzite. It is a hard crystalline rock, readily fractured by even slight crustal movement. The way this limestone was removed and the ore substituted in its place, is evidence that the rock was easily soluble in the waters depositing the ore. But why was this particular bed alone selected from a geological section of quartzite, shale, and limestone more than a mile in thickness? Prof. John A. Church, discussing the deposition of ores in limestone, says: "The operation of solutions whose composition we do not know can be judged only by their effects. When metasomatic replacement takes place in limestone, it is generally assumed that lime-carbonate goes into solution, its place being taken by the ore-substances. Limestone contains the elements for self-destruction, since the breaking up of one lime-carbonate molecule may cause the solution of another (by the carbonic acid set free); and, as this cannot be said of any other rock, we reach a possible explanation of the comparative frequency of orebodies in limestone. Ore-solutions exhibit a selective power which is extraordinary in a water fully supplied with dissolving qualities, but quite explicable in a solution which lacks that power."† The solutions that deposited the ore in the gray limestone ascended through fissures which connected with a source deep-seated in the igneous core of the Uinta axis, and in their up-flow traversed many thousand feet of sedimentary strata of widely variable mineral composition; yet they do not appear to have formed deposits in any place until they reached that favored horizon. My investigation of mineral formations in limestone, in other parts of the Great Basin, led me to believe that at the time the deposition took place, there existed a union of singular structural, physical, and chemical conditions in the special beds in which the ore occurs; that the solutions were, relative to the rock, chemically active, and that dynamic conditions that caused the shattering, cracking and fissuring of the strata, influenced the localization of the deposits. Analyses of the magnesian limestones over a broad belt at Tintic district, Utah, show that they vary but little in composition, and that eliminating the impure sediments, which seldom carry workable deposits, the structure of the rock appears to be far more important than the chemical composition in determining whether certain strata are ore-bearing or barren. In the Ontario belt the conditions are the reverse of those at Tintic; the prevailing limestones, without regard to the age of the geological formation, are impure and only occasional pure beds occur in the great thickness exposed. It is significant that the gray limestone, which constitutes the favorable horizon in the mines at Park City, is so pure that little sediment results from its dissolution. If structural conditions controlled, the quartzite on which the gray lime rests would also carry ore where broken and fissured—but the crushed masses of quartzite which occur are barren. In a few places, calcareous layers in this quartzite are observed to be replaced by ore. The evidence of the deposits in the gray limestone supports the view that the solutions were acid or neutral, poor in silica and with free carbonic acid in excess; that they were inert to quartzite and to all rocks in the series, other than pure calcareous sediments. The gray limestone is not alone ore-bearing; in the Crescent mine, on the northward flank of the Ontario belt, there occur eight distinct horizons, in the black limestone, that carry workable deposits.

In the case of the Ontario and Daly lodes, the character of the wall-rock influenced the localization. This action is due mainly to the fact that the material filling the fissure, which constitutes the gangue, is fragmental rock derived from the vein-walls. Owing to the vertical movement of over 500 ft., in the creation of these fissures, the rock-filling is dragged for some distance, especially where the lode is broad. Where the vein passes on the dip from one geological formation to another, the gangue is for this reason a mixture of the different rocks, and in consequence its favorable or non-favorable character for ore is affected. The nature of the wall-rock, and especially its mineral composition, influences the character of the gangue. This is shown where the walls of the lode are shale, which by its decomposition produces a clay gangue, impervious to the circulation of the mineral-bearing waters. Quartzite, on the contrary, yields an open permeable fissure-filling, in every way favorable for the deposition of the ore.

Secondary deposition alone has not been the cause of the occurrence of rich ore in the Ontario lode between the 250 and 1,050-ft. levels. The vein only goes to the surface in a few places, and the amount of ore removed by erosion has probably been limited. Oxidation and secondary enrichment are confined to the Ontario quartzite in vertical range and can in no way affect the question.

WALTER P. JENNEY.

San Francisco, February 20, 1906.

*This series of four articles appeared in the MINING AND SCIENTIFIC PRESS on January 6, 13 and 27 and February 17.

†*Trans. Amer. Inst. Min. Eng.*, Vol. XXIII, pp. 595 and 596.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—I am tempted to say a word in answer to R. H. Burrows' request, that his letter on the above subject "provoke some remarks from those of the mining fraternity." I judge from his letter that he favors the 5 by 16-ft. shaft, and from my personal experience I believe he has good reason on his side.

The following are the several points in favor of the rectangular shape shaft: First—Supposing it were to be sunk with machine-drills; it would be convenient to work two or three cross-bars, with a machine on each bar, this length of bar (4 to 4½ ft.) would be easy to handle and a round of holes could be drilled in a short time. Second—The timbering question would be simple, for the length of timber

would be such, that the cost would be close to the minimum; the timbers themselves would be easy to handle and put in place. This is an item that should not be considered lightly, for in many localities timber is scarce and expensive. Third—The economy of the 5 by 16-ft. shaft over the 10 by 10 as to breaking of ground, shoveling and hoisting dirt, may best be shown by a few figures; suppose the new shaft were started at the bottom of the old 10 by 10 shaft, which is down 325 ft., and it is intended to sink to the 2,300-ft. mark. The 5 by 16 has a bottom area of 80 sq. ft. against 100 sq. ft. of the 10 by 10; in sinking the 1,980-ft. (2,300–320) there would be removed 158,400 cu. ft. of rock in the former against 198,000 cu. ft. in the latter; a difference of 39,600 cu. ft., or 3,046 tons (allowing 13 cu. ft. to the ton). I shall not press the point further, by estimating the costs, etc., for they would be widely different for different districts. This item alone would not be of great importance were the 10 by 10 shaft better in every respect or did it show a marked advantage over the 5 by 16; I cannot see where it does, from Mr. Burrows' letter. As Mr. Burrows states, in shaft work it is not the difficulty experienced in accomplishing rapid drilling, but in handling the broken rock rapidly and getting it to the surface; a 'mucker' using a short-handle shovel can do as much work in the 5 by 16 shaft as he can in the larger one. Fourth—I should say that the 5 by 5 compartment for the pump and ladderway would be sufficiently large for all ordinary purposes; as a rule pipes for the pump, rails and timbers are sent down in the regular cage or bucket during stated periods in the day or night time, when both hoisting compartments are not working on ore. It would be a very simple matter to run timbers and pipes through openings, made between the sets into the pump compartment. Fifth—As for the 'jog' (where the new shaft started from the old one), that is not a serious feature, for it could be beveled off for a distance of 20 or 25 ft. in height, so it would cause no trouble, except possibly, in lowering materials through the pump compartment; that, however, is not necessary, as stated above. Sixth—I see no reason why there should be any difficulty in handling the desired tonnage (1,000 tons) with the two compartments, provided the hoisting equipment and the underground loading facilities were good; should it be advisable to greatly increase the tonnage, in the future, to say 2,000, 3,000 or 5,000 tons daily, would it not be better to sink one or more new shafts at other points? In that way a good system of ventilation could be established when connections were made. This is the scheme practiced by large companies throughout the world; mines, such as the Little Johnny at Leadville, the Portland at Victor, Colo., those of the Lake Superior region, and in fact in many other camps throughout the United States.

As Mr. Burrows states, it is the custom in every country to sink shafts of rectangular shape in preference to square shafts (this applies to shafts of the larger sizes). Every engineer and superintendent has his well-founded reasons for doing so, consequently there must be a decided advantage in the former. I have given a few points that have come within my experience; undoubtedly, letters from men of wider experience will be published by you, and I believe that each will refer to points in favor of the rectangular shaft that I have not mentioned.

Such subjects, as this pertaining to the practical end of mining, are very interesting and beneficial to all concerned in the business, and I believe that if more men who are actively engaged in mining, would express their ideas on the different subjects published under the head of 'Discussion,' it would be beneficial to themselves, as well as to the profession.

H. R. Plate.

Denver, March 2, 1906.

Black Sand of the Pacific Slope.

In accordance with an act of Congress, the Survey sent a circular, in 1905, to all the placer miners of the United States (about 8,000), inviting them to send to the Geological Survey samples of the heavy sands collected in placer gold mines. More than 1,000 such placer miners promptly responded with samples, which were at once assayed for gold and platinum. Further, these samples were scrutinized closely to detect the presence of various other minerals which have become industrially useful within the last five years. Among them are chromic iron ore, for the manufacture of paints, chrome steel and bichromate of potash; monazite and zircon, for the manufacture of incandescent gas and electric lights; magnetic iron ore, for the manufacture of steel; and especially tantalite and columbite, which have recently become very valuable in incandescent electric lighting. By reason of the prompt responses from the placer miners it was possible to examine sand from 34 States and Territories. It was quickly recognized that the distribution of valuable minerals in these sands is vastly greater than had previously been supposed. In addition to the useful minerals mentioned, considerable supplies were indicated of such valuable minerals as corundum, cinnabar (quicksilver ore), tin ore, garnet, and others. It was found that platinum occurs at many localities where its presence had not been suspected, and the majority of the specimens were found to contain gold in appreciable amount which it had been impossible to extract, either because the gold is very finely divided ('flour gold'), or because it is coated with iron oxide or other materials which prevent amalgamation (rusty or black gold).

The Victoria Bridge. (See Page 163.)

In order to determine whether these valuable minerals could be extracted at a profit, a number of concentrating machines of the best types were assembled at Portland, Oregon; for Portland proved the most central point for collecting the necessarily large quantities of these sands, and during the dry season, when the placer miners could not work, they could assemble at the Exposition and note the results obtained. The Geological Survey retained Robert H. Richards, dean of the mining school of the Massachusetts Institute of Technology, for a study of the extraction of these minerals.

It was quickly found that from 95 to 98% of the gold and platinum could readily be extracted from the black sand simply by concentration on tables of the Wilfley, Pinder, and Woodbury types. It had been expected that the sand would require preparation for these tables by a special machine known as the hydraulic classifier, but this machine proved unnecessary, inasmuch as the sand of the sea beaches and the heavy sand from sluice-boxes, from which the valuable ingredients, such as fine gold, rusty gold, and the useful minerals alluded to above, could not profitably be separated, proved to be in the best condition possible for separation on tables. The railroad companies of the West co-operated by free transportation of many carloads of sand to the Survey's plant at Portland.

These concentration experiments attracted very much more attention than was expected from the placer miners. Concentrating tables had never been used in placer mining to any extent, but many hundred mines are now being equipped with machines of this character. Several thousand miners visited the concentrating work during the summer, and they were generally convinced that these methods would apply to some sands, but not necessarily to their own; therefore many of them asked and received permission to submit samples of their sands as soon as the rainy season would afford water for collecting them. As the minimum amount of sand necessary for such concentration was 100 lb., and many of these mines are situated from 50 to 100 miles from a railroad or even a wagon road, the miners went to much expense to collect samples.

The Victoria Falls of the Zambesi. (See Page 163.)

Cost of Cables.—It appears that there are some 225,000 miles of cable in all at the bottom of the sea, representing $250,000,000, each line averaging about $1,000 per mile to make and lay. The average useful life of a cable nowadays may be anything between 30 and 40 years, according to the circumstances. About 6,000,000 messages are conveyed by the world's cables throughout the year, or 15,000 a day, the working speed for any one cable being up to 100 words per minute under present conditions. About 90% of these are in code or cypher for business and official purposes.

The Grand Central-Mammoth Decision.

These mines in dispute are situated in the Tintic district, Juab county, Utah, about 70 miles southwest from Salt Lake City. The Mammoth and Grand Central mines are on the western slope of the Tintic mountains, at an elevation of 6,000 to 8,000 ft. A great thickness of carboniferous limestone, two miles across, upturned and extensively faulted, constitutes the prevailing productive country. This limestone area is surrounded on the north, east and south by igneous rocks; on the west side the sedimentary formations dip beneath the gravel deposits covering the desert. Tintic district, it may be recalled, has been recently cited by W. P. Jenney as an example of block-faulting due to repeated volcanic disturbances.* A peculiar fault or clastic dike cuts through the mountain and traverses the ground in controversy. It is known as the Finn dike. A branch-fault which departs from it is called the Coates dike. These 'dikes' are frequently referred to in the decision. It should be understood that they are fault-belts, zones of brecciation, and not in any sense intrusive or igneous in formation, save that they were created by movement following upon the volcanic upheaval of the region. These dikes are not in themselves ore-bearing; although in the Mammoth mine the Finn dike is intersected by younger fissures carrying ore, which form deposits in the midst of the dike. The influence of the Finn dike in the deposition of the mineral; how, in the early working of the Mammoth mine, the dike was looked upon as the west boundary of the ore-bearing ground, and the attempt to utilize it, as a component part of the broad lode claimed by the Mammoth witnesses, are fully set forth in the decision. The position of the limestone beds, relative to the strike and dip of the lode in the several blocks of faulted strata traversed, also influenced the deposition of the ore. Thus, in the large block lying east of the Finn dike, the strike of the beds is northwest and the dip 35° northeast; the vein WU (see Fig. 1) cutting the beds on both strike and dip. In the smaller block between U and T, the vein UT conforms to the bedding, having a strike north 75° west, magnetic, and a dip 70° north. The great block in which occurs the Grand Central mine, situated west of the Coates dike, is formed by beds of limestone striking west of north in the direction of TS and dipping 75° west, the vein TS being nearly conformable to the stratification.

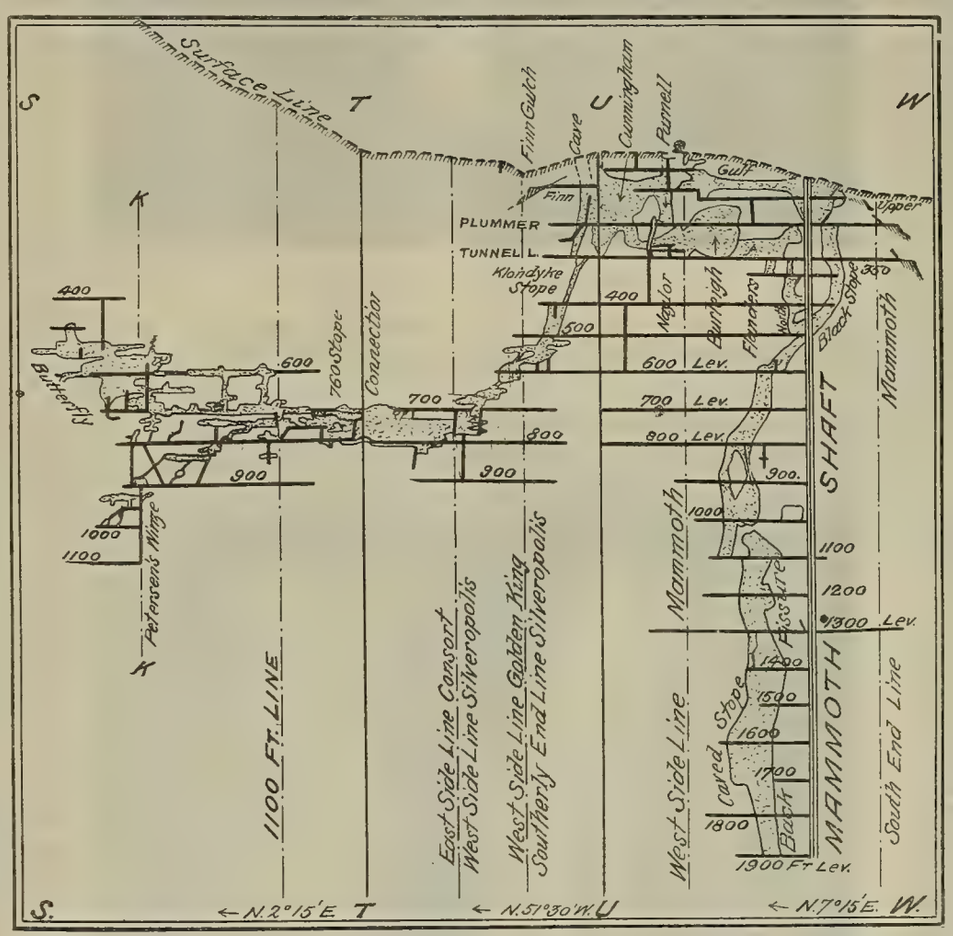


Fig. 1. Projection of the Grand Central and Mammoth Mines, on the Planes WU, UT and TS.

The plaintiff insisted that the projection on this plane exposes the vein on its strike and dip, while the defendant contended that its dip only is exposed, and that its strike is parallel to the side-lines of that lot.

The Grand Central claimed a fissure vein, modified by the nature of the wall-rock, having a course indicated by the stopes, following the lines WU, UT, and TS. The ore occurred in places in a more or less tabular form within the fissure; more commonly the solutions depositing the mineral attacked the limestone, and the ore formed irregular deposits, both within and without the fissure. The witnesses for the Grand Central maintained that the limits of the ore were the limits of the vein. It is not easy to describe the contention of the Mammoth—the broad zone of fractured and crushed country rock, taking in practically all the orebodies of the two mines, which included within the breadth claimed immense masses of non-mineralized limestone, that were in no essential way different from the limestone prevailing throughout the district. In the leading case involving the 'broad lode' theory, the Eureka-Richmond decision, the zone of mineral-bearing limestone was enclosed between a foot-wall of quartzite and a hanging wall of shale. But in the ground here in conflict, all such natural boundaries to the lateral extension of the mineral in its deposition were absent. By reason of this want of natural boundaries for their broad vein, the witnesses for the Mammoth were in difficulty to define in any place the breadth of the zone they claimed, or to fix the position of either its foot or hanging wall. The court quotes very fully the testimony of the witnesses for each party upon these issues. There were other difficulties: the Mammoth claimed that the lode apexed in the First Northern Extension of the Mammoth, Lot 38, from the south end to the 1,100-ft. line, and beyond, for no evidence was offered by the Mammoth that the apex anywhere departed from the mining claim. An inspection of Fig. 2 will show the line of stopes in the Grand Central mine rapidly diverging from Lot 38 to the west and northwest, so that any vein apexing in Lot 38 would have an almost flat dip, to include the orebodies in the Grand Central, north of the 1,100-ft line. And this in the face of the fact that the attitude of the vein in these mines, as shown by the stopes, is near vertical, the ore-bearing fissures conforming generally to the bedding of the limestone. In the ground in controversy, the strata-blocks are upturned on edge, so that any vein or lode, with dip assumed to approach horizontal, must cut the bedding. Further, the Finn dike is a normal fault, with downthrow on the west, or an upthrow on the east, (it matters not which, the relative displacement being the same). Evidence was offered by the Grand Central to show that a fault movement of 400 ft. vertical had taken place since the ore was deposited, whereby the country west of the dike, in which the Grand Central mine was situated, was relatively depressed, with respect to the ground east of the dike, where Lot 38 is located. And that at the time the deposition occurred, the top of the orebodies in the two mines was in the same horizontal plane; a fact which, if admitted, precluded the occurrence of any vein in the mammoth entering the Grand Central ground on the dip, or entering in any way save on the strike.

The Mammoth mine was discovered about 1870, and at the time of the trial in 1901, the production was stated to be $8,000,000. That of the Grand Central, for the few years the mine had been worked, aggregated $1,800,000. The ores vary widely in mineral character in the different orebodies in these mines, partly due to difference in original deposition and partly to subsequent oxidation. There are large bodies of quartz carrying gold with a variable amount of silver; also masses of high-grade copper ore associated with silver and occasionally of similar ore in which silver is absent; other bodies are mainly silver-lead ore. The mines are dry; no water has been encountered in the Mammoth from the surface to a depth of 2,200 feet.

In the Supreme Court of the State of Utah. Grand Central Mining Company, Respondent, vs. Mammoth Mining Company, Apellant. The plaintiff commenced this action in September, 1899, by filing a complaint in trespass, in which it alleged that the defendant had unlawfully mined and removed, from beneath the surface of the Silveropolis mining claim, ore exceeding the value of $300,000.

The defendant filed an answer and counter-claim subsequently amended. [These pleadings raise essentially the same issues as are decided in the second trial, here reviewed.—Editor.]

Upon the trial of the case, the court found that the vein, at its apex and on its strike did not continue within Lot 38 to the 1,100-ft. line, but that the apex passed over the westerly side-line of that lot and departed therefrom, at a point 700 ft. north of the south end-line of the lot, without again returning thereto, and dismissed the defendant's counter-claim.

Afterward, in April, 1901, another judge, presiding as successor to the one before whom the case had been tried, granted a new trial.

On November 20, 1901, the defendant filed its third amended answer and counter-claim, in which it alleged that the vein and lode at its apex and on its strike crossed the south end-line of Lot 38, and thence continued north in that lot to the 1,100-ft. line; that the apex of the vein was very broad, its width extending east of the east side-line of Lot 38, and overlapping portions of the Young Mammoth, Jenkins, Schley and Boss claims owned by the defendant; that its apex likewise extended west of the west side-line of Lot 38 and overlapped portions of the Jenkins, Golden King and Bradley claims, also owned by the defendant; that at no point south of the 1,100-ft. line did the apex wholly depart from Lot 38, the lode upon its course conforming to the side-lines of the lot; that Lot 38 was the senior location and long preceded all the other mining claims mentioned in the counter-claim; and that the vein on its dip to the west departed from the side-lines of Lot 38, passed under and beyond the surface limits of the Jenkins, Golden King and Bradley claims, and extended, at a depth of 700 ft., under the south end-line of the Silveropolis mining claim, further on its dip to, and beyond, the limits of the Silveropolis and Consort claims, and embraced all the orebodies lying underneath those claims south of the 1,100 ft. plane. The prayer was that the defendant's title to those orebodies be quieted against the adverse claim of the plaintiff.

To this counter-claim, the plaintiff answered, alleging that it was the owner of the Silveropolis and Consort claims, and of all the veins and ores therein or thereunder and within planes extending down vertically through the boundary lines of these claims. On the issue thus formed the case was again tried. A jury was empaneled advisory to the court to pass on certain issues.

The trial commenced Nov. 21, 1901, and lasted 70 days. The only issues tried were those formed by the defendant's last counter-claim and the answer thereto. The defendant introduced a vast amount of evidence for the purpose of showing that the vein or lode continued at its apex and on its course within Lot 38 from its south end-line to, and beyond, the 1,100-ft. line, and that the same was continuous on its dip to, and beyond, the Silveropolis and Consort claims, and embraced all orebodies found in either of those claims lying south of the 1,100-ft. plane.

Respecting the width, or exterior limits of the vein, Wm. A. Akers testified: "The boundaries of this vein would be the limits of the fracturing which had occurred and been produced by the dynamic forces exerted in creating the vein. Q. And so far as that fracturing extended, so far you would claim your vein extended? A. Plus any additional width of ore or vein-matter that might be produced by metasomatic change. Q. Would you claim that the limits of your vein were coincident with the limits of the fracturing? A. No, sir; not where replacement had changed the limits of the fracturing. Q. Would you claim that your vein extended at least as far as the limits of the fracturing? A. Yes,

*"Block-Faulting and its Relation to Ore Deposition." MINING AND SCIENTIFIC PRESS, page 54, Jan. 27, 1906.

Fig. 2. The Principal Stopes of the Grand Central and Mammoth Mines.

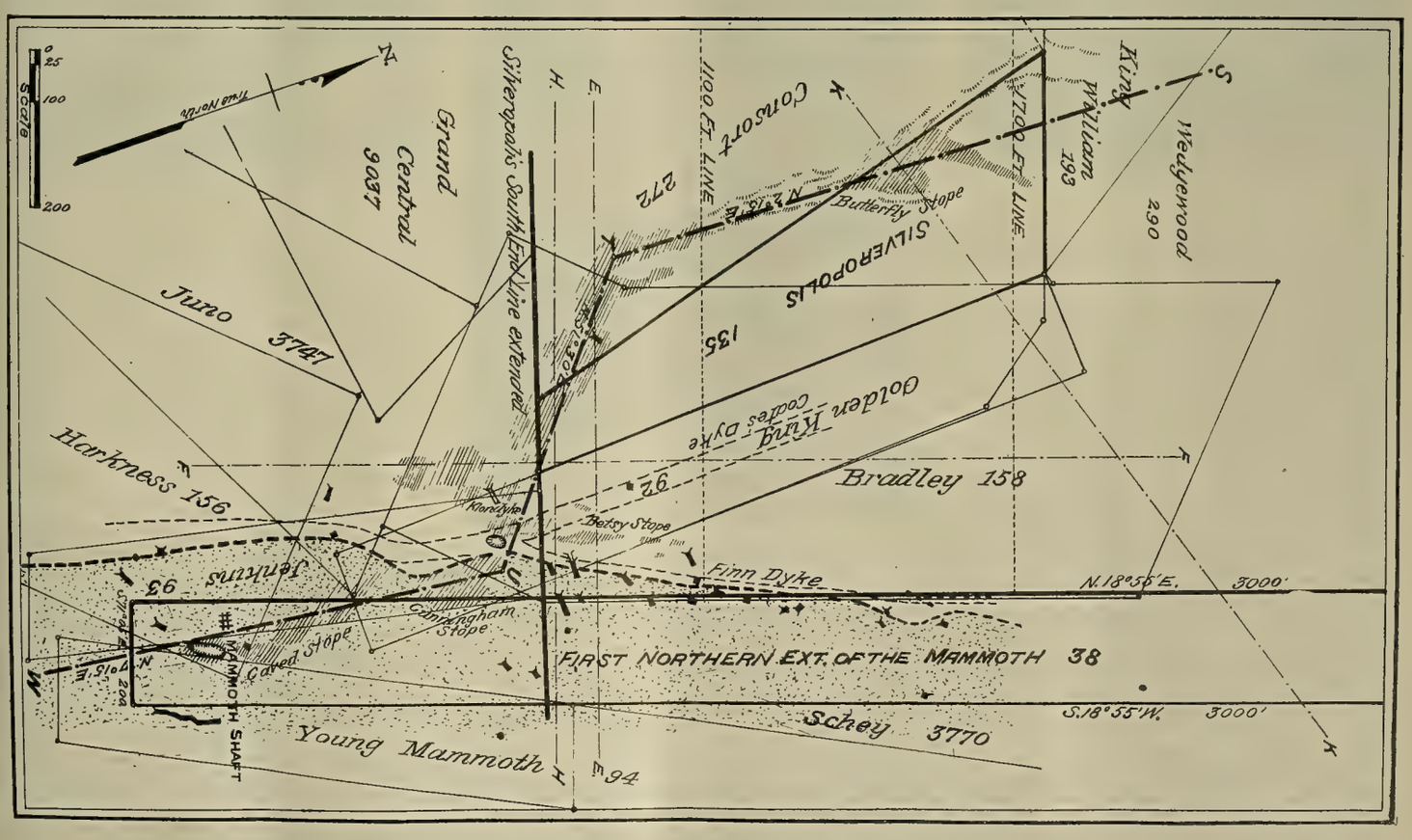


Fig. 3. Surface Boundaries of the Litigants in the Grand Central-Mammoth Case.

sir." The witness also stated that the vein was a "fissured section of limestone," and the witness, Watson, testified that, as he understood it, the vein was "bounded by the fissuring," and that "if the fissuring were all connected" and "extended 4,000 ft." he would say the vein extended that far. He could not determine from the developments on any level whether any of the workings extended beyond the foot-wall boundary of the vein.

From the testimony of Samuel McIntire, it appears the vein, as shown by the developments, on the 900 level is nearly 900 ft. wide, on the 700 level 1,050, and on the 600 level 1,020 ft. in width.

Walter P. Jenney says: "I consider the limit of the vein to be the limit of the mineralization."

James Talmage testified: "The boundaries of this orebody or vein, throughout its entire extent, would be determined by the nature of the mineralized matter, using the term, as indicating ore matter when it carries valuable metals to an amount in excess of the valuable metals carried by the country rock."

Walter P. Jenney, speaking of the Finn break, said: "In the first movement the rocks were shattered and broken up into large pieces, many feet in dimensions, and lines of sheeting or fissuring parallel with the dike were made through the rocks adjacent to the fissure. Then, as the movement continued, these masses of rock were pulverized more and more —more and more broken. It is very irregular in width, in some places only 15 ft. wide, in other places it would expand to 30, 40 or 50 ft. in width; where it united with the Coates dike on the south, it is possibly 100 to 125 ft. wide. The dike appears to have grown from its eastern side toward its western. On the eastern side, which would be its foot-wall, we find a heavy, tough stratum of clay; that is due to the grinding movement of one wall moving upon the other."

Sidney Tyler, referring to faulting, testified: "I think that there has been movement along the line of the foot-wall of the Finn break and on different parallel slips, included within the Coates dike, which has resulted in the dislocation of the orebody in a dropping of the orebodies lying west of the dike to a position anywhere up to 400 ft. or so, lower than that formerly occupied before the faulting took place."

The case was thus submitted to the court, and the jury returning a verdict upon the special issues, in favor of the plaintiff, the court adopted the verdict and found, agreeably with it, that the top or apex of the vein continued, from the south end-line of the first northern extension of the Mammoth, Lot 38, to the place where the Cunningham stope at its north edge or end crossed in its northwesterly course the west side-line of that lot, such point or place being, as found, 690 ft. north of such south end-line, and 90 ft. south of the south end-line of the Silveropolis mining claim, extended east in its own direction across Lot 38; that at that point the vein on its strike and at its apex wholly departs from Lot 38, and does not continue within that lot between the planes drawn through the Silveropolis south end-line extended, and the 1,100-ft. line; that such apex does not continue north of such end-line within the limits of Lot 38; that between such planes on that end-line so extended, and on the 1,100-ft. line, there is no apex of any lode which on its dip extends to and includes the orebodies known to exist beneath the surface of the Silveropolis and Consort mining claims, between those planes; and that the apex of the lode, which is in the south end of Lot 38, does not continue in that lot north of the Silveropolis south end-line extended.

Notwithstanding this decision, which was substantially the same as that at the previous trial, the judge filed a written opinion, in which he concluded that there are two veins in the Mammoth ground, and he argued that the orebodies in controversy belonged to a vein which had its apex in the Golden King and Bradley mining claims, and could be recovered by the defendant in a proper proceeding. Thereafter the defendant asked leave to amend its counter-claim, and later to file an original counter-claim, in accordance with the expressed views of the court. These requests being refused, the defendant prosecuted its appeal.

After stating the case, Chief Justice Bartch delivered the opinion of the court:

The main question is, whether the court erred in finding that the vein at its apex and on its northwesterly course crosses the western side-line of Lot 38 and wholly departs from that lot at a point 690 ft. north of its south end-line, and north of that point does not continue either at its apex or on its strike to or beyond the 1,100-ft. line within the limits of Lot 38; and that there is no vein having an apex or any part thereof within the limits of Lot 38 north of the south end-line of the Silveropolis mining claim extended eastward in its own direction, and south of the 1,100-ft. line, which, on its dip, extends to and includes any of the orebodies existing underneath the surface of the Silveropolis and Consort mining claims, south of the 1,100-ft. line.

In determining this question the surface of Lot 38, the extra-lateral rights of that lot, the dip and strike of the vein, and the underground workings of the mines are important factors. The extra-lateral rights, upon which the appellant has founded its claim to the orebodies in dispute, accrued to it as owner of Lot 38, by virtue of the provisions of Section 2,322 of the Revised Statutes of the United States, whereby the owner of a mining claim has a right to follow, between vertical planes drawn downward through the end-lines of the location, a vein, having its apex within the limits of such claim, on its dip to the deep, although such vein may so far depart from a perpendicular in its course downward as to extend outside of the vertical side-lines of the surface location. The orebodies in controversy, however, being situated without the limits of Lot 38, and underneath the surface of the Silveropolis and Consort mining claims, the appellant, notwithstanding the law of Congress, is met at the very threshold with the presumption that they belong to the respondent, the owner of those claims. Where a person owns a patented mining claim, although the statute reserves the right to locators of other mining claims to follow their veins under its surface and extract ore, he is presumed to own all the ore within planes drawn vertically downward to the deep through the boundary lines of such claim, as well as the surface and everything else appurtenant to the claim; and such presumption continues until some other locator or owner establishes the fact that he is entitled to exercise the reserved rights by virtue of the statute. "Within the lines of such location the owner shall be regarded as having full right to all that may be found, until some one can show a clear title to it as a part of some lode or vein having its top and apex in other territory. To state the proposition in other words, we may say that there is a presumption of ownership in every locator as to the territory covered by his location, and within his own lines he shall be regarded as the owner of all valuable deposits, until some one shall show by preponderance of testimony that such deposits belong to another lode having its top and apex elsewhere."

To overthrow this presumption and establish its rights to enter its neighbor's ground to extract ore the burden of proof was upon the defendant, and it was incumbent upon it to show, by a preponderance of the evidence, not only that the apex and strike of the vein were in Lot 38, north of the south end-line of the Silveropolis mining claim, extended, and to the 1,100-ft. line, but also to show that, between planes drawn vertically downward through that end-line and the 1,100-ft. line, the vein, from its apex, on its dip, was continuous; that its continuity extended to, and through, respondent's ground; and that the orebodies in question formed a part of the vein.

We concede, as claimed by the appellant, that a patent to a mining claim raises a conclusive presumption that there is the apex of a vein within the patented ground (1 'Lindley on Mines,' Sec. 305); but there is no presumption that it is the apex of the vein in dispute, and such presumption applies equally to the Silveropolis and Consort mining claims as to Lot 38, and does not shift the burden of proof in this case.

Respecting the geological features of the country in which the properties are situated, there is practically no conflict. It is shown that the mines are found in a lime belt that covers about two miles square, and is the great producing area of the Tintic district. In some places the limestone beds are upturned, large areas tilted upon edge, the beds dipping nearly vertically, while in other places they dip at lower angles, and in special areas the dips are quite uniform, and again, though, it seems, not frequently, anticlinals exist. This limestone is surrounded on all sides, except the west, by igneous rocks. The sedimentary rocks are broken up and fractured, evidently the result of igneous intrusion. The limestone carries the different forms of iron oxide, also some manganese, and, in places, the limestone is crushed, crumbled and brecciated. How these beds of sediment were dislocated, bent and upturned, is not free from doubt. Whatever the cause, the disturbance is apparent from the evidence. The surface of the limestone area, wherever exposed, is marked with innumerable seams, cracks and small fissures filled with carbonate of lime. Quartz, spar, and other materials, characteristic, in general, of mineral-bearing limestone areas, are present, and, in places, the surface material is brecciated and recemented. A trace of mineral, of one or more of the precious metals, and, in places, more than a trace, even where there is no known vein, seems also to be characteristic of that lime belt. The witnesses for the appellant, who had examined the surface and open-cuts as well as the underground workings of the mines, testified, in general, that the fractured, stained and brecciated conditions appeared to such an extent upon the surface and in the open-cuts of Lot 38 as to furnish unmistakable evidence of the apex of a vein; that the vein was so clearly defined upon the surface, and so distinctly differentiated from the adjacent country, that its boundaries could readily be traced throughout the length of that lot, and be recognized by mere observation; and that the indications showed the apex to be so wide that it overlapped the side-lines of that claim.

The leading witness for the defendant, William A. Akers, an expert of much scientific knowledge, after testifying that the Mammoth was a fissure vein, and that it was not an individual fissure, but consisted of a series of approximately parallel fissures, or breaks, in the fractured mountain, said: "Taking this individual vein; this broad, beautifully defined fissure that I personally have traced for a distance of between three and four thousand feet on the surface, we find that it is clearly defined on the surface, and so clearly and distinctly differentiated from the adjacent country that I could identify all points generally along the course of that vein. I could stand at one end and as far as the configuration or topography of the country permitted, see how that vein ran; and to guide me in the other direction, namely the southerly, a portion of the ground not in controversy at all, I could see the vein there through extensive workings for say a thousand or two thousand feet."

While the defendant's witnesses are emphatic in asserting an apex in Lot 38, and clearly defined differentiation of the surface of that lot from the adjacent country, none of them attempted to locate upon the surface, or fix the hanging or foot-wall of the vein, north of the Silveropolis south end-line extended, nor north of that point at the Cunningham stope where the court found the vein departed from the lot, and yet, if its differentia be so clear that, "to recognize its boundaries," one, as claimed by Mr. Akers, need but look at the surface, aside from the open-cuts, the query naturally and logically arises why, in a controversy of this magnitude, its vital and decisive point—the apex of the vein—was not traced and definitely fixed within the disputed territory. Why was such a point left to mere conjecture, to mere inferences from disputable surface appearances? The only answer, which this voluminous record affords, comes from the witnesses for the plaintiff, and that answer has the support of the findings of the court. These witnesses say, with at least equal emphasis, that no such differentiation exists; that there are no indications of a vein or apex on Lot 38 north of the point where the Cunningham stope crosses its west side-line, which is about 90 ft. south of the Silveropolis south end-line extended; that, apart from the dike material, the limestone, north of that point, within Lot 38, is not any more broken and brecciated than in the adjoining country to the east and west; that neither the calcite, the calcspar, the iron seams, the iron stains, nor the fracturing or fissuring is any more abundant within the limits of that lot, north of that point, than for a long distance to the eastward and westward; that wherever, in that belt, the surface of the rock is exposed by erosion or otherwise, there appear innumerable seams, cracks, small fractures or fissures, running in every conceivable direction, filled with calcite, stained more or less with iron, in instances containing some manganese; and that in many places the surface material is brecciated and re-cemented.

The evidence also shows that numerous samples were taken from the various open-cuts and exposures, but, with few exceptions, the assays of those samples taken north of the Silveropolis south end-line extended revealed either nothing or but a trace in any of the precious metals, and the few exceptions yielded little more than a trace—simply such results as may be obtained, at least according to the evidence of the plaintiff, in many portions of that limestone country where no vein exists, or beyond the limits of any vein.

(TO BE CONTINUED)

BISMUTH.—The marketed production of bismuth ore in the United States in 1904 was 5,184 pounds, valued at $314. No sales were reported in 1903 or 1902. A total of about 83 short tons of crude bismuth ore is reported as having been mined but not sold during 1904. The price of refined metal is kept so low by the combination controlling the business that profitable mining of our domestic ores is practically out of the question. Bismuth is valuable for the quality it gives its alloys with certain metals, by virtue of which they melt at low temperatures. The chief alloys are with lead, tin, and cadmium, singly or together, and in varying proportions according to the use to which the alloy is to be put. The melting point of the several alloys in common use ranges from 60° C. to 94.5° C., and they form safety fuses for electric apparatus, safety plugs for steam boilers and automatic fire extinguishers, some solders and dental amalgams, matrices for plaster or wax casts, etc. The bismuth alloys are used also for baths in certain operations which require liquids at definite temperatures below that of boiling water.—E. O. Hovey, in *Mineral Resources*.

THE *Engineering Record* gives an account of some magnetic observations which have been made by Thomas Russell, United States assistant engineer in the Tamarack copper mine, at a point 4,760 ft. below the ground, in a level about 1,200 ft. from the shaft. It was found that the diurnal range of declination in the mine, the difference between the morning eastern and the afternoon western elongation was 14 minutes of arc, which is about the same as observed at the surface of the earth at the same place. The times of elongation, or of maximum deflection, were about the same as at the surface. The total magnetic intensity in the mine was about one-fortieth part greater than at the surface of the ground, or 0.6227 of a dyne, as compared with 0.607. It was found that the dip decreased and the intensity increased as the observer descended farther into the earth. The work was done as part of the Great Lake survey.

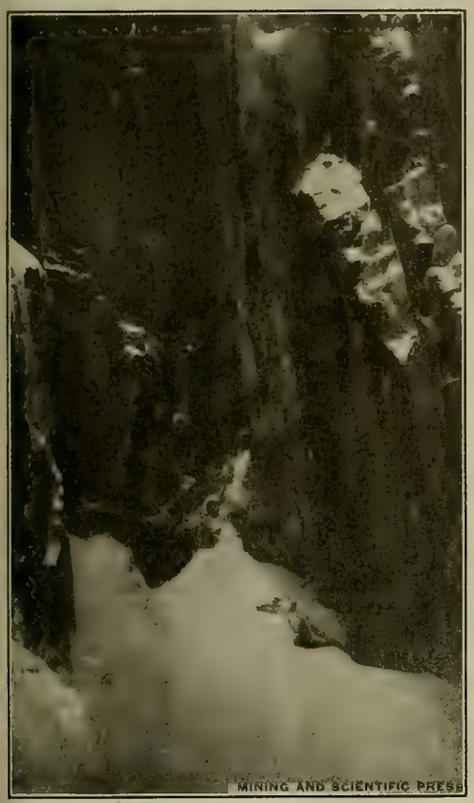
Cobalt.

Written for the MINING AND SCIENTIFIC PRESS by D'ARCY WEATHERBE.

This now celebrated mining camp is situated at an altitude of 925 ft. immediately west of Lake Temiscaming and 103 miles north of North bay, on the Canadian Pacific Railway, in Ontario, Canada.

The Temiscaming & North Ontario Railway (owned by the Ontario Government) which connects the mines with North bay, extends beyond Cobalt for some 50 miles; it is still in process of construction and it will eventually join the new trans-Canada Road near Lake Abitibi, and thus afford an entrance into that vast northland, so long the eager hope of the prospector and lumberman.

A handful of shacks grouped round a wide-eaved railway station comprised the Cobalt of June, 1905; January, 1906, saw over 100 buildings, two frame-and-shingle banks, a large stamped-metal boarding-house and the usual collection of pool-rooms, restaurants, barber shop and Chinese laundry, etc. The typical building of the townsite and mines is a log cabin, of varying size, built of round timber roughly hewed square on the inside and stogged with plaster or cement mortar—not with mud or moss, as is usually seen in the remote wooded country of Lower



Bluejay Vein at Surface.

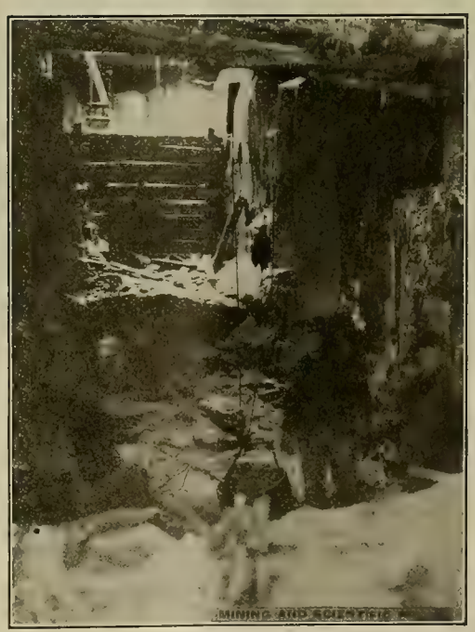
Canada. Besides these log cabins there are, interspersed throughout the settlement, shacks of every conceivable shape and structure, the board and tar-paper variety predominating.

I reached Cobalt in a storm of rain and sleet, after six hours in a '19-mile-an-hour' train, stuffy and crowded with a polyglot collection of humanity, speculators and business men from Toronto, miners seeking work, lumbermen with their snow-shoes, *habitants* of the district (Cobalt is only 20 miles from the Quebec border) reeking with *rouge* tobacco, and a few women and children. It was impossible to get a bed in the town, but fortunately I met an old college mate, R. W. Brigstocke, formerly connected with the Ymir mine, in British Columbia, and now manager of the Drummond mines at Cobalt, who made me most comfortable at his quarters; in fact, it is due to his kindness, combined with that shown me by R. J. Trethewey, N. A. Timmins and Capt. Harris, that I was enabled to see their mines under the most favorable circumstances.

I had little opportunity, however, of examining the surface conditions, as three feet of snow lay on the ground, and the country, which is undulating, is covered with a thick growth of hacmatack and spruce and both in topography and flora greatly resembles Nova Scotia.

The excellent reports of Mr. W. G. Miller, published by the Ontario Bureau of Mines, give a very full account of the geology of the district and tell of the development work on its immensely rich veins, up to June of the past year. Since that date, new discoveries have been added to the list, and instead of the six mines that were producing at that time, there are now 27 separate workings in operation in, and around, Cobalt—an area four miles long by two miles wide. True, some of these are only shallow pits on mere veinlets, but in this district where the ore runs to so much money per ton and in some cases is practically all native silver (valued at present at 66 cents per ounce), the fact will be appreciated that it does not take a large mine to produce a big fortune. I saw in the stock-shed at Timmins' La Rose mine 400 tons of ore in sacks, one bin of which was said to assay between $1,200 and $1,300 per ton. This mine has already produced, it is said, over half a million dollars from workings consisting of two shafts, the

La Rose Mine, Cobalt, Ontario.



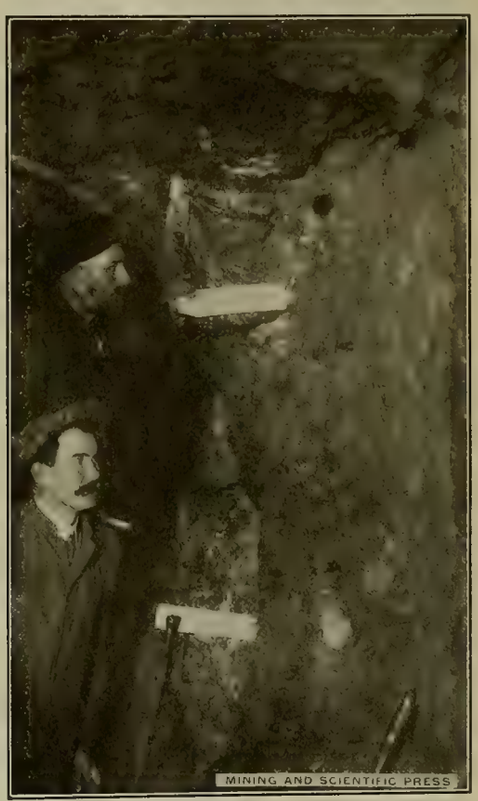
Cinderella Workings, Drummond Mine.

deepest of which is only 135 ft., a level (at 100 ft.) less than 450 ft. long and a winze 70 ft. below this level. (See Figure 1.) These are not extensive workings to make such a production, particularly when it is considered that the ore taken therefrom averages probably less than 12 in. thick and that not an ounce of it has as yet been stoped. Moreover these are the most extensive workings in the district, no other mine having yet reached a depth of over 70 ft. From the whole district more than $2,000,000 worth of ore has been produced to date, that is since October, 1903. La Rose Company has opened several other veins on the surface and from one has shipped three carloads of ore. The plant consists of two small boilers, a steam hoist and a four-drill Rand compressor supplying two machine-drills in the mine.

The extraordinary variety of metals and minerals in these ores, as explained fully in Mr. Miller's last report, is amply illustrated in a cabinet collection in the office of La Rose Company. There, the delicate pinks and greens of the cobalt and nickel blooms contrasting with specimens of native and ruby silver and relieved by the duller hues of the pyrite and pyrrhotite, bismuth, antimony, galena, with the sulphides and arsenides of the rarer metals, form as attractive a collection as could well be got together and will make a rich addition to the display in the Ontario Bureau of Mines.

On the day following my arrival the thermometer dropped to 12° below zero and a biting wind made it most disagreeable. My available time was short and although I had a cursory view of almost all the workings in the district I was only really able to examine, beside La Rose mine, the operations of the Drummond Mining Company and part of the workings at Tretheweys; these are the three most important mines. I was pleased to see that a Nova Scotia syndicate had struck it rich at one point. The manager is Mr. Woodworth, recently of the Big Five Company, at Renfrew.

The Drummond Company is working at two points on the east side of Kerrs Lake and close to the shore (Fig. 2 and 3). The methods of opening and extracting the ore—it can hardly be called 'mining' yet—



La Rose Vein. (See A, Fig. 1.)

generally employed in the district are exemplified here (see Fig. 2 and 3 and photograph). The vein is stripped for a short distance along the outcrop, and trenched for about 20 ft. deep. A shaft is then sunk, either at one end or in the middle of the trench, and the opening is lagged over with heavy poles while a sort of open stoping operation (underhand method) is carried on pending the sinking of the shaft to a depth necessary for a regular drift. The hoisting is being done by horsewhip and derrick, as is also the unwatering; but a boiler, hoist and small compressor have been ordered. A diamond drill has commenced boring on the property to prove the veins in depth.

In the Cinderella workings, three veins, aggregating about nine inches of ore, are being mined, and at the Bluejay pit, a vein (Fig. 4, and the photograph), which at the surface measured about eight inches, split up into several bands consisting chiefly of calcite and cobalt bloom; at a depth of 20 ft. it is giving good percentages in native silver and smaltite, but is reduced in size to between two and three inches. The ore when hoisted is all picked over in the cobbing shed by two men; at present it is divided into three grades: No. 1, chiefly composed of cobalt and silver; No. 2, calcite and silver; and No. 3*, a lower grade ore, which is at present left on the dump. No. 1 and 2 are said to comprise over half the ore mined. The shipping ore is placed in sacks measuring 15 in. by 21 in. and weighing 110 lb. when full. Much care has to be taken in packing and

*It has been stated that under the prevailing freight rates and prices paid for ore in New York, it does not pay to ship any material assaying under $50 to $60 per ton.

shipping on account of the great value of small lots, and when I was in Cobalt two ore-thieves were in limbo, at the neighboring town of Haileybury, awaiting trial. A great nuisance to the managers of the mines is the importunity of visitors who ask for souvenirs—which in this district practically means begging for *money;* indeed, at one of the chief mines situated close to the railway the owner informed me that during the past summer over $1,000 had been carried off in this manner. The consequence is that at the larger workings strict rules are in force prohibiting any one from access to the mines or buildings without a special permit from the company's office.

At the Trethewey mine, a short distance west of the railway and near the townsite, a number of veins have been opened, but their average width is not over 2½ in.; three or four of these have been opened by trenches to a depth of about 20 ft. and two shafts, each about 70 ft. deep, are in process of sinking, a small compressor, hoisting plant and air-drills being employed in these operations.

At the Coniagas* property, controlled by Trethewey and others, the open-cut on No. 3 vein represents the curious sinuosity in strike mentioned at one place in Mr. Willet G. Miller's report, and partly accounted for by the vein dividing around a columnar structure in the country rock; the dip of the vein, as is usually the case throughout the district, is about vertical. Some of the ore now being mined on this property contains $3,000 per ton in silver. Three lumps of ore, almost entirely native silver, in the Imperial Bank at Cobalt, weighed 270 lb., 236 lb. and 30 lb., respectively.

All of the veins so far discovered, with the exception of a few in the diabase and one or two supposed to be in the underlying Keewatin rocks, occur in the measures assigned to the Lower Huronian. By reason of the great age, metamorphism and shattering, the stratification or bedding of these rocks is not readily apparent, but it is evident that they generally lie at a comparatively flat angle and the veins, which cut them vertically, have, as a rule, a smooth wall on each side. One of these walls is generally utilized when breaking the ore in the mine.

The supply of labor is at present in excess of the demand, but it is largely composed of men who are simply congregated here to accustom themselves to the conditions, so as to be prepared for prospecting immediately the snow leaves the ground. It is expected that spring will advent the greatest rush that has ever been experienced in Ontario, and much anxiety is felt as to the intentions of the Government in the matter of modifying the existing mining laws and throwing open for prospecting the timber limits lying immediately south of the camp.

Labor is paid prices approximately the same as in British Columbia; the rates at most of the mines are as follows: Surface labor, $1.50 to $1.75; miners, $1.75 to $2; helpers, $2 to $2.25; drill men, $2.25 to $2.50. In each case, board and lodging, equal to about $5 per week, is paid as well. Undue excitement and a boom atmosphere prevails at Cobalt, and fabulous prices are asked for merely superficial exposures of ore. Town lots, too, are selling at unreasonably high figures. One 20-ft. front (of stumps), situated on a rough side-hill, was reported as selling at $400 the day I left. Doubtless, such conditions are the inevitable accompaniment of bonanza discoveries and one pleasurable feature that I observed was the universal caution so far exercised in regard to expenditures in plant, equipment, etc., at the mines. Companies with heavy capitalization, and in some cases, I fear, with doubtful assets, are being floated with more frequency each week.

Up to the present time, I believe that no vein has been found to extend from the Lower Huronian rocks (in which they generally occur) into the underlying Keewatin, which, according to Mr. Miller, do not afford the same favorable conditions as the former. The *extreme* known thickness of the Huronian in this district is given at 500 ft., but this only occurs in spots, great erosion having denuded all but the ancient hilltops. The one or two veins, said to occur in the Keewatin, are not excessively rich, and they may have been of earlier origin than the Huronian veins. At any rate, they and the few veins occurring in the diabase, are not characteristic of the producing ore deposits of the district and need hardly be taken into account when considering upon the general question of persistence. Only one vein has been traced for as much as 1,000 ft. along the surface and it is extremely doubtful whether this was rich at more than a few spots, if indeed at more than one. All the worked veins in the district, I am told, do not average six inches in thickness and many of them have been proved to become smaller in depth.

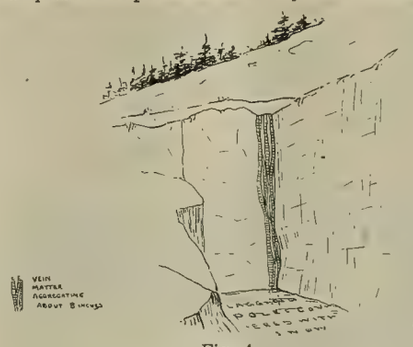


Fig. 4.
Bluejay Vein at Surface.

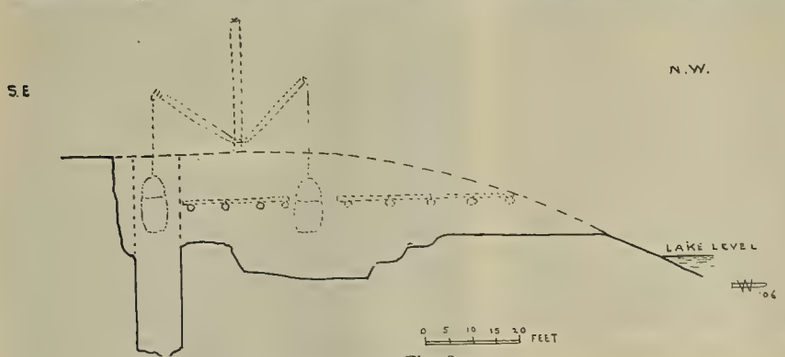


Fig. 2.
Longitudinal Section, Drummond Mine.

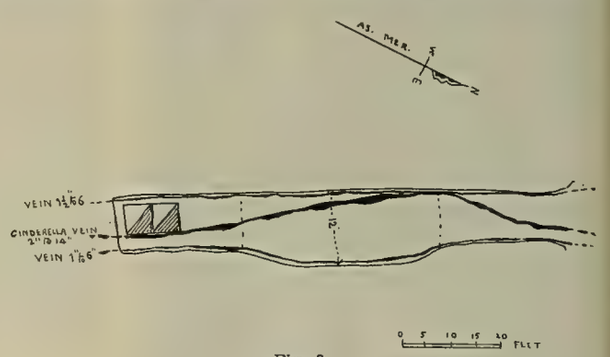


Fig. 3.
Plan, Drummond Mine.

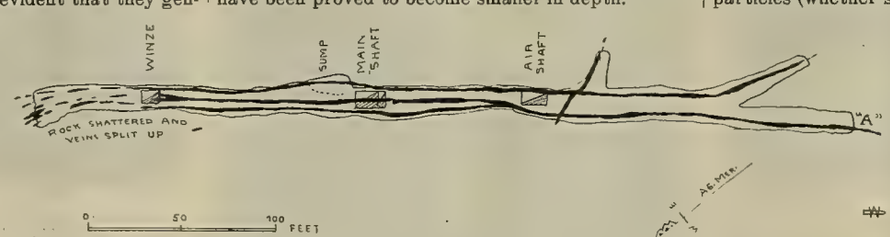


Fig. 1.
Sketch of 100-ft. Level, La Rose Mine.

In the light of these facts, reckless expenditures and high-financing methods incidental to a boom should be discouraged, at least until more has been learned of the practical character of the deposits by drilling and mining. No doubt much money will yet be taken from the veins now being worked and those probable veins yet to be discovered, but development work so far can hardly be said to point to future mines which, though probably containing extremely rich ore, approach the unlimited in depth and extent

The smelting companies to which the ore has been shipped, are now only paying for 90% of the silver, nothing being allowed for the nickel, cobalt, and, particularly, for the arsenic. Recently parcels of ore from Cobalt that had been shipped to the Eastern States for treatment were re-shipped to Canada to the International Nickel Company's modern smelter at Sudbury. Experiments there have proved successful in eliminating and collecting the arsenic and in producing a matte of the other metals which can be refined. These facts were given me by the general manager of the smelting works. The practical suggestion of Mr. Miller, of erecting an arsenic reduction plant at some point between Cobalt and the Temagami district, which contains the high percentage mispickel ores, is well enough, but whether it is a good idea to add to this a smelter and refinery, as has also been suggested, for the treatment of the metals in the Cobalt ores is doubtful at present, as the process is said to be expensive and extremely difficult, and requires much careful experimenting to perfect. About 200 miles of freight charge, at least, would be saved by such a plant, however, and with the application of available water-power the treatment charges could be reduced to a minimum.

*So called from the fact that each successive pair of the letters in the name is the chemical symbol of some metal in the ore.

Lime in the Cyanide Process.

In the cyanide process lime has two principal functions: one chemical, in neutralizing acid; the other mainly physical, in coagulating slime and hastening the settling of fine particles. In slaking, the calcium oxide (CaO) takes up water to form the hydroxide $(CaOH)_2$, which dissolves in water to the extent of about one part in 800. This solution neutralizes sulphuric acid, and decomposes ferric sulphate contained in the ore or tailing, or developed in them by oxidation during treatment, and also combined with carbonic acid derived from the atmosphere, thus protecting the potassium cyanide. In this respect it is preferable to caustic soda, as the carbonate of calcium is insoluble in water, and the sulphate but slightly soluble, so that they do not accumulate in the solution, as the corresponding sodium salts would do if NaOH were used as a neutralizing agent. Soluble carbonates are also precipitated by it, leaving caustic alkali in solution, thus:

$$CO_2 + Ca(OH)_2 = CaCO_3 + H_2O$$
$$Na_2CO_3 + Ca(OH)_2 = CaCO_3 + 2NaOH.$$

Its effect in settling slime is of a more complex character. Much of the material properly classed as slime is of a 'colloid' nature, and when brought in contact with pure water becomes almost gelatinous and impermeable to solution. Certain substances added to the water, notably alum, lime, acids and soap, coagulate or flocculate this gelatinous material and cause it to separate into more or less distinct particles or agglomerations. Again, excessively fine particles (whether slimy or not) if suspended in water and settling very slowly, have their rate of settling much increased by the addition of lime, acids, alum or other salts. The causes of these phenomena are as yet imperfectly understood, but they are of great importance in hydrometallurgy and in agriculture. Although, weight for weight, lime is less efficient in coagulating and settling than either alum or sulphuric acid, it is generally employed both for slime and for soil, because of its additional advantage in neutralizing acids. The question of settling has been studied by Barus, United States Geological survey, *Bulletin* 36, and by several others whose work is summarized by Julian & Smart, 'Cyaniding Gold and Silver Ores,' page 204, *et sequitur.*

A WATER-PROOF CEMENT has just been patented in Germany. A mixture of vegetable wax and caustic lime in boiling water is added to unground portland cement clinker, and all ground together. The inventor makes the claim that one-half inch coating of this cement placed on a brick wall will render it absolutely water-proof. The formula is given as follows: To each two hundredweight of cement clinker is added a mixture of three-fourths of a pound of Japan vegetable or berry wax, and one ounce of caustic lime which has been dissolved in 14 pints of boiling water. These ingredients are thoroughly mixed, and when cooled are dried and ground very fine with cement clinker.

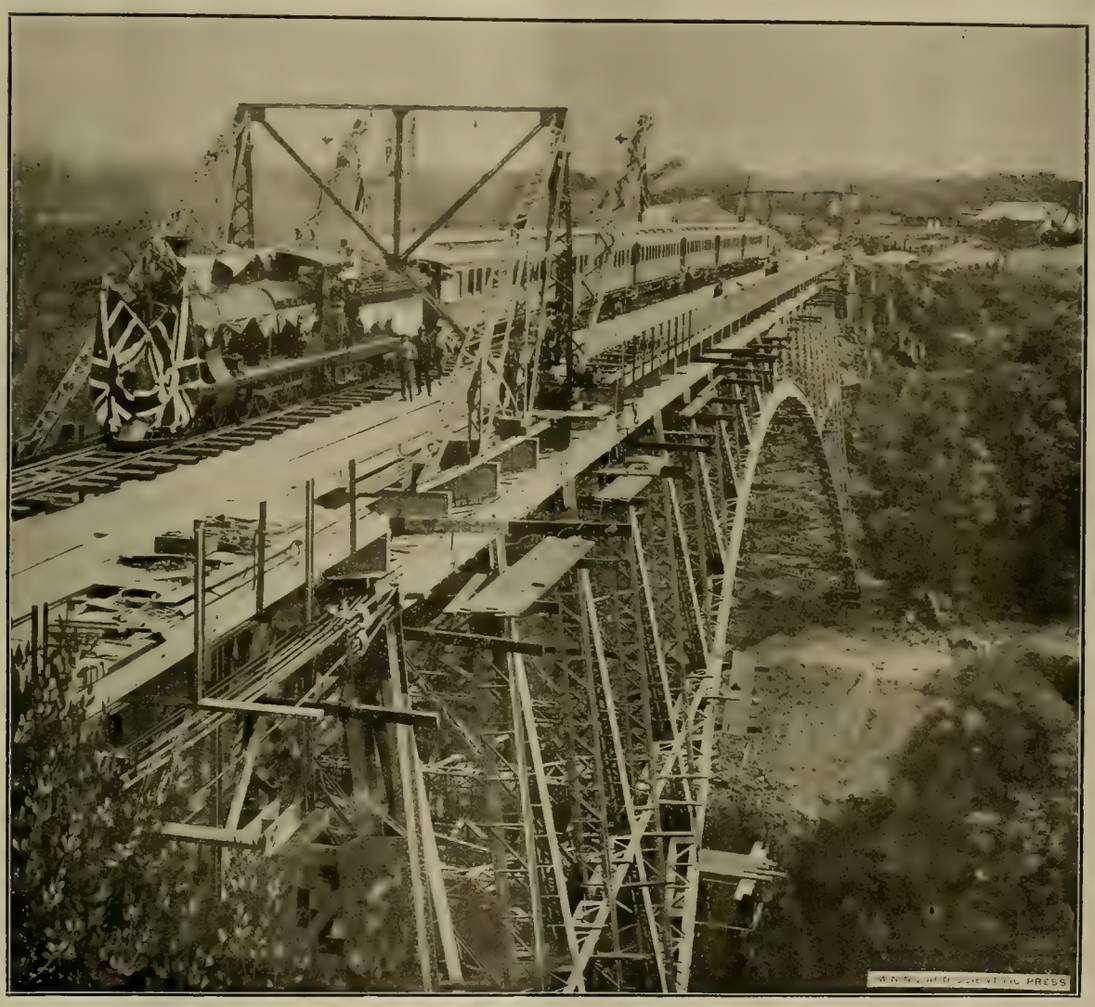
THE coal production in the principal coal-producing countries of the world was in 1904, the latest available year, as follows: United States, 314,563,000 tons; the United Kingdom, 232,428,000 tons; Germany, 118,907,000 tons; France, 33,303,000 tons; Belgium, 23,135,000 tons, and Japan, 9,701,682 tons, the quantities in each case being long tons of 2,240 lb. each.

Victoria Falls Bridge.

Specially contributed to the MINING AND SCIENTIFIC PRESS.

Writing about the Rhodesia railways in 1900, to Mr. Ewart S. Grogan—a traveler who had just completed an adventurous journey from the Cape to Cairo—Cecil Rhodes said: "We propose to go on and cross the Zambesi just below the Victoria Falls. I should like to have the spray of the water over the carriages." Were Cecil Rhodes alive now he would see his dream realized, for the railway from the south has been carried from Bulawayo, through the valuable coalfields at Wankie, right up to those wonderful falls, which are twice the height of Niagara and more than double its width, and, simultaneously with the construction of the Victoria Falls bridge, has been pushed forward till the railhead is now 260 miles north of the Zambesi.

The bridge has been constructed at a spot where the gorge is 650 ft. across at the upper level, and the depth from the top to the surface of the water below, in the dry season, is nearly 400 ft. The sides of the chasm are formed of an igneous rock, hard in structure, reddish brown in appearance, and well covered with vegetation. Prior to the construction of the bridge this rock had always been thought solid, but when the work of excavating the foundations for the abutments of the main arch was undertaken, it was discovered that the upper part of the south bank was composed of rock debris to a considerable depth. This unexpected circumstance not only caused much unforeseen labor and loss of time, but it necessitated the lowering of the level of the entire bridge by 20 ft. It is probable that the place where this debris lay was formerly the precipice over which the water fell, previous to the time when the dividing barrier between it and the present fall was removed by the erosion of water. The bridge consists of a main span 500 ft. long, the arch of which it is composed being 15 ft. deep at the center and 105 ft. at the springing. The rise of the arch is 90 feet.



The Cantilever Bridge Across the Zambesi.

The contract for this great engineering work was finally secured by an English firm—the Cleveland Bridge & Engineering Company of Darlington—and although everything possible was done to assist the contractor, the erection of the bridge was a matter of much difficulty. He was provided with free transport to the spot for all material to be used, houses were built for the workmen, and a powerful aerial cableway was provided for the transport across the hitherto impassable gorge of one half of the material for the construction of the bridge, which was designed so that it might be built out from both sides simultaneously.

The cableway consisted of a steel wire rope of 8.4 in. circumference, with a breaking stress of 270 tons, and 830 ft. long, suspended between two supports, one of which was vertical and of ordinary type, the tension of the cable being carried by guy-ropes fastened in the rock. The other support was inclined and carried a weight of several tons, equal to the working stress on the cable. As the conveyor moved across the gorge to the center this weight was lifted, but fell again as the conveyor moved over to the far side. The effect of this 'compensating' arrangement was to make the power required for operating the conveyor more uniform throughout its travel. The conveyor, of the 'Brothers' type, carried its own driving mechanism, operated by a Crane motor of 20 b.h.p., and lifted a load of 10 tons at a speed of 20 ft. per min. and traveled with it at 300 ft. per min. The motor received current from a trolley wire crossing the gorge, the electric supply being obtained from a small generating plant sent out for this purpose. This plant consisted of a dynamo, running at 970 rev. per min., and generating 220 volts, driven by a portable engine of 14 nominal horsepower.

The conveyor successfully handled all the material required for the northern half of the bridge, and many thousands of tons of permanent-way material required for the construction of the portion of the line north of the Zambesi. Some time before the completion of the bridge, the main cable and the conveyor showed signs of wear. As the plant was of such vital importance, both a spare cable and conveyor were constructed, but, as a matter of fact, the original plant held until the bridge was sufficiently completed to permit of a contractor's road for carrying railway material being laid across it.

Owing to the immense depth of the chasm, the bridge was designed so that, throughout the process of its erection, commencing from opposite sides, each half is a cantilever until their ends, reaching one toward the other, join in mid-air, when it becomes an arch. This type of design made an efficient anchorage during erection a necessity. The strength of the attachment had, therefore, to be equal to the pull caused by the weight of the projecting bracket or cantilever, with a sufficient surplus for safety. The pull on the anchorage apparatus was estimated at 400 tons, and in the present case the means of attachment were provided by a series of steel wire ropes. These were secured to the top of each cantilever, and carried to a point some distance to the rear, where they entered a hole bored downward in the solid rock, through it at right angles to the bridge, and up again on the other side; thus each wire formed a loop gripping the rock, with its free ends fixed to the cantilevers.

The most difficult part of the construction of the bridge was the erection of the end spans, but when once the tall end-posts of the main span were erected, and the short spans were connected with them and the shore, affording a stable platform to start from, the work proceeded rapidly and smoothly.

The designing of the bridge was the work of many months in the office of the company's engineers, Sir Douglas Fox and Sir Charles Metcalfe, the calculations being long and laborious. The quality of the steel of which the structure was composed was strictly defined in the specifications, and the material itself, which was rigidly inspected and tested, is capable of bearing an ultimate tensile strain of 30 tons per sq. in. As regards quality and accuracy of workmanship, it was stipulated that the principal members should be made to within one thirty-second of an inch of their calculated length. Before being shipped, every panel of the arch and lateral bracing was put together in the contractor's works, and fitted with perfect accuracy.

Owing to the spray from the falls which descends upon the bridge during the wet season, the question of maintenance is of paramount importance, and it is an important feature of the design that every portion of the steelwork is accessible to the painter's brush. The painting can, fortunately, be succcessfully carried out by natives. This is particularly satisfactory, as, prior to the advent of the railway, there was not a native living within 60 miles of the falls, owing to their superstitious dread of the locality, but now that this has been overcome the proper preservation of the structure is assured.

A special and most suggestive feature of transportation by steam, electricity and other kinds of mechanical force is that its capacity is not only unmeasured and unknown, but will doubtless prove to be practically inexhaustible. That is to say, no certain limits can be assigned to the operation or effect of these new agencies as compared with those which have been superseded. Therefore, speed may reach many times the rate now attained, the size of vehicles may be greatly increased and the cost of carriage for the longest distances reduced to an astonishing minimum; so that as progress goes on in developing the means and methods of distribution, the habits and needs of men will be more and more modified, with consequences to social order and the general conditions of life which may be far greater than have yet been imagined.

But this is not all. Another fact is still more wonderful. Coincident with this sudden transfer from animal power to steam have come the new and amazing means of transmitting intelligence. In a brief generation the barriers of time and distance, hitherto so formidable, have been swept away by telegraph and telephone. No longer limited to the agencies by which material things are transported, we send our thought and speech with lightning swiftness to the four quarters of the globe, and hold all lands and peoples within the sphere of instant intercourse. So recent is this miracle that we are dazzled by its marvels without realizing its tremendous import.

That this substitution of steam and electricity as the instruments of commerce and communication has been an immeasurable gain is witnessed here and everywhere by half a century of unparalleled progress. Along these wondrous pathways the world has literally leaped. Released from dependence on beasts of burden, the entire realm of industry has been quickened and enlarged; productive energy has been vivified by new and limitless means of distribution; the products of the whole earth are embraced in wide circles of exchange; all the luxuries of all lands are brought to every household; wealth has multiplied until we are almost surfeited with its abundance, when other people possess it; the genius of invention has been stimulated to larger exercise, the sphere of thought grandly extended, the impulses of charity awakened to nobler activity, while keener sympathy through closer contact is pointing the road to real brotherhood.—Martin A. Knapp in *Science*.

STEAM SHOVELS are now being used for stripping copper deposits, in a manner resembling the practice of the iron mines of Minnesota and Michigan.

The First Writer Upon Mines.

Written for the MINING AND SCIENTIFIC PRESS by a Special Contributor.

"There was a man in the land of Uz, whose name was Job." Thus in a few simple words we are introduced to the earliest known writer upon mines. Unnumbered centuries before Lyell wrote, and the science of geology sprang into being, Job recognized the paramount agency of volcanic disturbance in the upheaval of the geological formations in mountain building. Thousands of years before Dana and Judd and Dutton had studied volcanoes; before Powell and Gilbert of the United States Geological Survey made known the Basin Range structure and traced the evolution of the mountain ranges in the great volcanic region of the West, Job described a similar desert region in the Far East and the evolution of its topography. "As for the earth, out of it cometh bread; and under it is turned up as it were fire. The stones of it are the place of sapphires; and it hath dust of gold. He putteth forth his hand upon the rock; he overturneth the mountains by the roots. He cutteth out rivers among the rocks."

Although from the dawn of history, sapphires were found in gravel deposits, associated with other precious stones, nothing was supposed to be known of the geological formation from which they were derived, until Weed published the finding of sapphire in the igneous dikes of Yogo gulch, Montana. For no one appears to have understood the meaning of the passage, where Job, describing the evidence of igneous upheaval in the earth's crust, recites, "The stones of it are the place of sapphires; and it hath dust of gold."

In the early part of the last century, Humboldt was impressed with the association of igneous rocks with ore deposits; a theory treated in the most convincing way, in our own day, in that classic paper of Kemp, 'The Role of the Igneous Rocks in the Formation of Veins.' The genetic relation of volcanic phenomena with the occurrence of mineral formations, seems to have impressed Job as it did Baron von Humboldt. The evident belief of the writer of Job, that minerals were formed through fissures coming from the unknown depth of the earth's crust, is the accepted theory of our leading specialists upon ore deposits. "There is a path which no fowl knoweth, and which the vulture's eye hath not seen; the lion's whelps have not trodden it, nor the fierce lion passed by it."

Special mention is made of the occurrence of silver and gold in veins; while iron ore was mined from deposits in the earth, and brass (which also included bronze), was smelted from a mixture of the ores of copper and tin, and of copper and zinc. "Surely there is a vein for the silver, and a place for gold where they fine it. Iron is taken out of the earth, and brass is molten out of the stone."

The opening verses quoted, of the 28th chapter of the book of Job, appear to be only a fragment; it is thought that a portion of the poem is lost—a view supported by the repeated interruption of subject. Possibly no passage in the Bible has been more often misquoted, or is less understood than the opening verse; "Surely there is a vein for the silver, and a place for gold where they fine it." Gold-quartz veins are known to have been worked, at a time so remote that all record is lost, in parts of Africa tributary to the commerce of the people of the East. It is probable that river gravels were washed for gold at a still earlier period. At first, the rock was broken by stone hammers, and at a later date, metal tools were used. Fires were built against the rock-face, and when the quartz was hot, it was shattered by throwing water upon it. The ore was crushed by large stones, and the gold obtained by winnowing the dry pulp with mats, in a manner similar to that employed in working dry placers. Where water was available, it is probable that the crushed ore was washed over matting to catch the gold, in the way now practiced in Japan. The numerous excavations, and the remains of stone mills used in grinding the ore, in the ancient gold-quartz mines of Zanzibar (by whom, or when worked, nothing is known), show that even before the historic period, the arts of mining and treating ore were well advanced. Beyond the sphere of influence of modern civilization, the East changes little its ways of doing things in the lapse of ages, and it is probable that the primitive methods of extracting and refining the metals, in use in remote regions at the present day, closely resemble those employed in the time of Job.

Gold obtained from dry placers or from river gravels, was of a fineness suitable for immediate manufacture into ornaments, the "jewels of fine gold," but much of the gold of the veins was combined with silver and had to be first refined. The refining of the vein-gold was a long and tedious process, requiring so much fuel that it was usually carried out at the mines, in mountainous districts where wood could be readily obtained. Fuel was possibly as scarce in the grazing country in which Job lived, as it is on the plains of the West. As practiced in remote parts of the East, gold alloyed with silver is refined for the manufacture of jewelry, by native goldsmiths, who use a process of cementation with salt that is probably of very ancient origin. The gold is melted and cast in thin discs, which are packed on edge in a furnace, imbedded in a mixture of wood ashes and crude salt, and subjected to prolonged heating at a temperature such that the silver is gradually converted into chloride, without melting the gold. The discs are removed from the furnace, and while hot are thrown into a strong solution of salt to dissolve the silver chloride formed. After cleaning by scouring with ashes, the discs are melted, re-cast in discs, and charged as before in the furnace. The process is repeated until the gold is of the desired fineness. The salt used, obtained from the natural salt lakes of the country, is often mixed with sodium sulphate, which in the cementation aids the chloridizing of the silver by decomposing the sodium chloride. The term, 'fining the gold,' seems to have been sometimes applied to the whole process of extraction of the gold from the ore and the subsequent removal of the silver. The refining of silver and also of gold (alloyed with copper and other base metals), by cupellation with lead, upon a hearth of leached wood-ashes or bone-ash, is supposed to have been first practiced in the mines of Greece and the Mediterranean provinces. Whether the process of refining by cupellation, was known in the time of Job, the fragment preserved of the 28th chapter gives no information. It is probable, however, that the knowledge of fusion methods of refining, came from the West, with the knowledge of mining for the ores of silver and lead.

Job closes with these words: "But where shall wisdom be found? and where is the place of understanding?" "Man knoweth not the price thereof; neither is it found in the land of the living."

Concentration.

The object of concentration is to separate or 'concentrate' the rich particles containing the valuable metals from the great mass of sand, in which they are disseminated, and which may be either the tailing from a mill where they have already been subjected to various processes, or may be the direct product of grinding low-grade ores. In general, it may be said that the 'concentrate' constitutes the particles saved coarser than 100-mesh; the 'fine' that between 100 and 500-mesh, and settling in water quickly, while 'slime' is in a still more minute state of division and is held in suspension by the water, or floats on top, settling only after long standing. Slime is collected only by adhesion, or cohesion, as the mineral in this state flows off readily in a stream of water, and refuses to settle away from the accompanying gangue. If dry points occur, the water, as a consequence, runs in streaks, and at the junction of the wet and dry channels minerals will be picked up and floated away on the surface of the water; this 'floating' of the mineral is caused by its dryness, not by its lightness—it has been coated with a film of air. 'Middling' is a term used to describe particles of gangue firmly united with minute particles of ore; it is a product generally obtained in the process of concentration. It is common practice to return this product to the head of the table; but as the ultimate object to be attained by concentration is the separation of the mineral from the gangue, the procedure is useless, for the second effort of concentration simply repeats the first process, and will be of no avail unless it includes re-crushing, to liberate the metallic mineral.

The tendency of a mixture of ore particles of approximately similar size, but of varying specific gravity, is to arrange themselves when in motion in layers according to their gravity. Another important feature on which concentration is based is that thorough settling sends the heavy metallic minerals to the bottom, leaving the lighter on top, any other material too low in grade to pay for further treatment being run to waste. The concentrate—if rich enough—is shipped without further handling; but it is found occasionally economical to re-concentrate it over another table, running at slower speed and increased grade; in this case two machines of the same type are used, the concentrate from the first passing directly to the second. With some ores it is advisable to re-concentrate the tailing from the first operation in order to further save that portion of the slime which may contain sufficient value to warrant this additional treatment.

As a working guide, it may be stated that an ore to be considered capable of concentration must have a gangue which mills freely, so that the fragments of the concentrate may be freed from the gangue without being reduced to slime. That is to say, the gangue should either break readily or be softer than the enclosed metallic minerals. It is also essential that the valuable minerals be fairly hard and of a distinctly heavier specific gravity than the gangue, as otherwise not only will they be reduced to slime in the process of milling, but it will be impossible to separate them afterward. Lead carbonate and the carbonates and silicates of copper may, therefore, be classed among those ores which are to be excluded from treatment by concentration.

The earliest and simplest form of concentrator is the miner's pan. The shaking action given by the operator tends to settle the heavy grains to the bottom, while the light and worthless particles are washed away by the water. Broadly speaking, we may divide the methods of wet concentration under six heads:

1. Concentration by a large and nearly horizontal stream of rapid running water, where, the whole mass being in free motion, the heavier particles sink to the bottom and are caught by 'riffles,' and the lighter are washed away. This is the sluice-box of the hydraulic miner.

2. By a thin skin of comparatively slowly moving water mixed with fine material only. Under this head may be classed 'undercurrents,' blankets, canvas tables, etc.

3. The same as No. 2, but with the addition of action in some form, to assist in settling the heavier particles.

4. The same as No. 2 and 3, but with the motion arranged in such a way as to cause the heavy particles not only to settle to the bottom, but to travel continually in one direction, so as to assist in the separation of the sand and the heavy mineral. Generally speaking, the motion of the particles is at right angles to the direction of the current of water. (Table concentration.)

5. In which the motion is arranged so as to merely cause settling, the current of water removing the sand. This, in conjunction with a moving belt, forms the well-known belt concentrator, or Frue vanner.

6. In which opposing currents of water in a tank are utilized in a combination with gravity to classify the particles and make a separation. These are known as hydraulic classifiers, and their operation depends on what is known as "the law of equally falling bodies," which may be stated as follows: "Bodies falling free in a fluid fall at a speed proportionate to their weight divided by their resistance." From this it will be seen that small masses of a heavy mineral will fall as rapidly as large masses of a light mineral, owing to the fact that the weight increases as the volume, and the resistance only as the area. These hydraulic classifiers are generally used to size the pulp of a mill before passing it to the concentrators, and especially to separate the very fine slime.—*Bulletin*, the Joshua Hendy Machine Works.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rocks from Oasis, Nev., are: No. 3, andesite; No. 4, diabase.

The rocks from Orseco, Or., are: No. 1, felsite, containing pyrite; No. 2, diorite.

The white mineral specimen from Dayton, Nev., marked S. G. T., is gypsum; variety, satin spar.

The two mineral specimens from San Jose, Cal., are: No. 1, a slaty gouge; No. 2, crystalline limestone, containing iron sulphide.

The sample from Breckenridge, Colo., marked T. A. B.: No. 1 is aplite (a micaless granite occurring in dikes and intrusive masses).

The rock sample from Dyer, Nev., is metamorphic. Some of it is greenstone schist, and some pieces consist almost wholly of granular quartz, others largely of iron. The bright, shining mineral, resembling galena is micaceous iron ore (hematite).

The rock samples from Badger Hill, Cal., are: No. 1, a dike rock, somewhat altered. It contains a little pyrite. No. 2 is a feldsitic dike rock. The sulphide is marcasite (white iron sulphide). No. 3 is a much-decomposed, igneous rock of granitic type.

The rocks from Atwater, Cal., are: No. 1, greenstone schist, with red iron oxide, green copper carbonate, and a little quartz; No. 2, quartz, with mispickel (arsenical iron sulphide); No. 3, quartz and iron oxide, with iron-stained clay. No. 2 may be gold bearing.

The rocks from Nevada City, Cal., marked J. R., are: No. 1, felsite, containing finely disseminated pyrite. No. 2 is a silicious dike rock. No. 3, diorite; No. 4 is evidently an altered dike rock, in which occur quartz and pyrite. This last rock may be gold bearing and should be assayed.

The rock samples from Homestead, Or., are: No. 1, a metamorphic, silicious rock, containing green epidote. No. 2, a much altered, granitic rock, apparently from the vicinity of a vein. This rock may contain gold. No. 3, calcite (calcium carbonate). No. 4, a fine-grained dike rock (diorite ?), containing a little chalcopyrite. No. 5, similar to No. 4, but rather coarser grained. No. 6, diorite.

Mining and Metallurgical Patents.

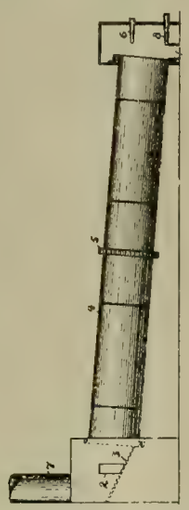
PATENTS ISSUED FEBRUARY 20, 1906.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

AGITATOR FOR CYANID SOLUTIONS.—No. 812,460; H. P. Smith and F. J. Hobson, Guanajuato, Mexico.

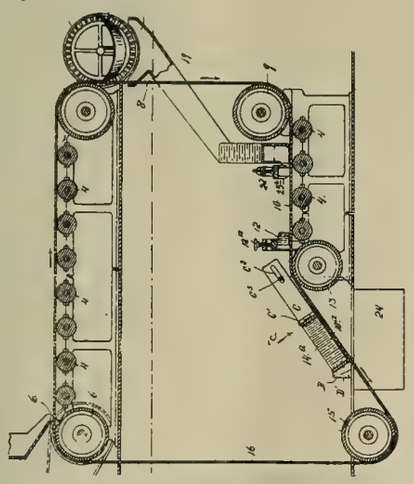
In apparatus for treatment of ores, tank and shaft rotating therein, stirrer-arms operated by shaft, pipes carried by stirrer-arms, and means for supplying pipes with compressed air; such means permitting removal of pipes from solution in tank at desired times.

PROCESS OF TREATING ORES.—No. 812,473; E. W. Arnold, San Francisco, California.



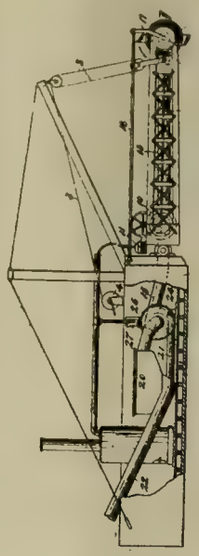
Treatment of refractory ores which comprehends heating of ore to incandescence, and direction of blast of chlorin gas and charcoal-fumes upon and into body of ore, while latter is in state of incandescence.

ORE-SORTING BELT.—No. 812,270; F. W. Jacques, Victor, Colorado.



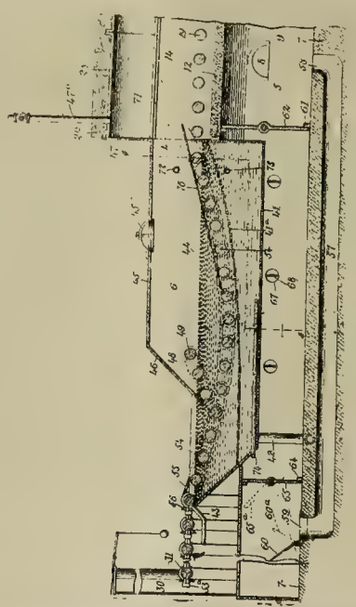
In ore-belt apparatus, combination of endless traveling belt or apron one part of which is considerably higher than other, means for delivering ore to be treated, to upper portion of belt, rotary grizzly for receiving discharge from upper portion of belt, chute for receiving finer material which passes through grizzly between its extremities, and arranged to discharge material upon lower portion of belt, vertically adjustable spreader located adjacent point of discharge and extending transversely of belt, and discharge device mounted above belt remote from spreader and consisting of stationary inclined wings located to scrape material from belt and discharge same on opposite sides thereof, arm pivotally connected with apex or angle of inclined wings and adapted to be swung in either direction for purpose of discharging whole of material on either side of belt, and small V-shaped device located above central portion of belt and directly in front of pivoted arm when in its central position whereby material upon belt is prevented from interfering with action of arm.

DREDGER.—No. 813,252; V. A. Strom, Alameda, California.



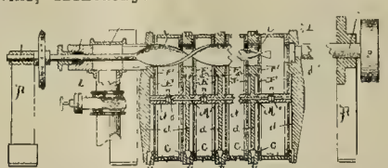
In dredger, float, hinged ladder projecting therefrom, with means for raising and lowering its front end, an excavator carried upon front of ladder, an internal receiver into which excavator discharges, receiver having closed bottom and open top, means whereby receiver may be turned axially relative to ladder to maintain its open portion uppermost during raising or lowering of ladder, and a suction pipe connecting with receiver.

PROCESS OF TREATING METALS.—No. 813,206; H. H. Goodsell, Indiana Harbor, Indiana.



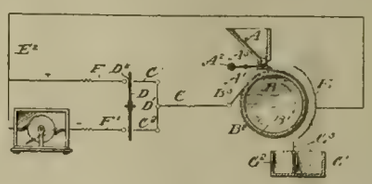
The method herein described of treating plates of metal, which consists in subjecting the same to action of aeriform body, of which different portions are heated unequally, plates being first brought into contact with portions of aeriform body having comparatively low temperatures and passed successively along to portions having higher and higher temperatures, and finally causing plates to emerge into open air.

FILTER-PRESS.—No. 813,121; S. Thurstensen, Louisville, Kentucky.



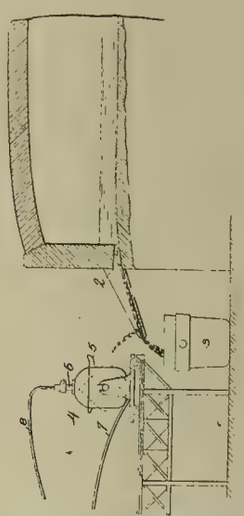
In filter-press, series of separated filter-plates having near their tops alining apertures adapted to have material distributed therethrough, rotatable worm-feed passing transversely through all of alining apertures, filter surfaces of filter-plates being provided with plurality of closely adjoining ribs forming deep narrow channels, filter-screen for each of filtering surfaces, drains on each of plates communicating with channels therein and adapted to receive and discharge liquid therefrom, means for rotating worm-feed to clear apertures and distribute material, alining hubs for each of filter-plates outwardly extending to contact inner face of filtering screen, abutments outwardly extending from hubs and adapted to clamp filtering screen between hubs and abutments, and bolt for each of filter-plates passing through hub and clamping abutments, hubs and abutments extending continuously from end to end of filter and adapted to distribute pressure on intermediate filter-plates to end plates.

PROCESS OF SEPARATING SUBSTANCES OF DIFFERENT DIELECTRIC CAPACITIES.—No. 813,063; H. M. Sutton, W. L. Steele and E. G. Steele, Dallas, Texas.



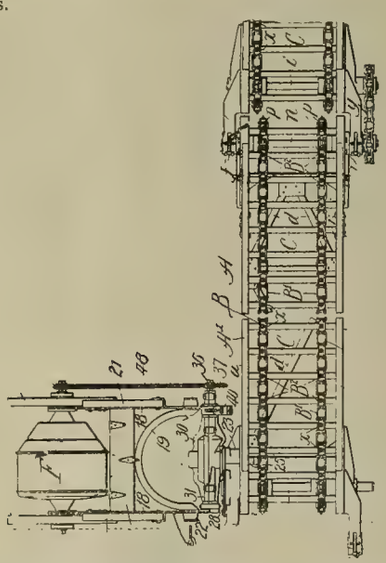
In process of separating particles of mass or components of a mixture, developing in particles or components dielectric hysteretic impedance, and separately collecting the particles.

PROCESS OF COMBINING TITANIUM WITH OTHER METALS.—No. 813,278; F. E. Canda, New York, New York.



Process of combining titanium with other metals, which consists in melting separately titanium-bearing material and the metal to which the same is to be added, and then uniting the two molten substances.

CONVEYER.—No. 813,134; C. H. Anderson, Chicago, Illinois.



In conveyer, conveyer frame having sides each constructed with mutually braced parallel upper and lower channel bars forming guides, shafts journaled toward opposite ends of the frame, sprockets on shafts, endless parallel conveyer chains, extending around sprockets, formed of alternate heads and links pivotally connected together, an endless series of transverse tubes connected toward opposite ends with heads of respective chains, shafts passing through and journaled in tubes and movable at their ends in guides, and driving means for the chains.

Mining Summary.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

LONDON, February 21.

The old order changeth slowly in the ancient seabound strip of country west of the Saltash bridge. In the days of yore when the Limited Liability Act of 1862 was still unborn, mining as conducted in Cornwall in its relation to local coloring, somewhat resembled the old pocket boroughs in which the County participated—the outsider was not permitted to share in its mysteries. Under the 'cost book' system such modern questions as 'ore reserves,' 'parity of assets,' 'redemption of capital,' &c., do not trouble the 'adventurers' or shareholders.

If money is required to prove a likely piece of ground, or the engine bob develops an unsuspected flaw, or a new boiler is decided on—the financial exigencies are met by a 'call' just sufficient for the wants of the moment. Profits when accrued are divided up to the hilt; with no provision for a rainy day, a not very prolonged run of bad luck exhausts the resources or the patience of the adventurers, and the 'bal' being 'skat,' the pitwork is drawn, the machinery sold, and the erstwhile scene of activity becomes a desolation.

But there is a reverse to the picture. The records of the past abundantly prove that Cornishmen were able to triumph over the difficulties of finance as well as those imposed by nature. Mr. Peter Watson, than whom there is no better exponent of Cornish mining in its most acceptable form, when presiding over the Wheal Grenville meeting the other day, reminded his audience that the Carn Brea district alone—the 'Rand of Great Britain'—had produced from twenty-five to forty millions sterling. The meeting in question was a characteristic one—breezy and hopeful. The chairman and manager each had a pleasing account to give for the past twelve weeks—178¾ tons of black tin sold, which realized £17,279. Net profit £3,934 after deduction of lord's dues, amounting to one-fifth of the profits. The 6,000 shares stood at about £9½ in the market. Dividends amounting to £2 8s. per share had been paid during the year, or about 25% on the market price. At the deepest point, 320 fm., the first western shoot had been struck, worth —for the seven fathoms explored—£50 per fm. Other improvements were reported. Up to the present Wheal Grenville operations have been limited to the flat lode. The Polgine lode in the southern part of the 'sett,' worked successfully fifty or sixty years ago, is now receiving attention. It has been unearthed in clearing out the old workings and found to be three to four feet wide with an average value, where cut into, of 28 lb. black tin per ton. Wheal Grenville as a 'cost book' mine has introduced the daring innovation of a reserve fund!

In addition to these good things, the committee were able to give their 'adventurers' the chance of subscribing for shares in Condurrow United Mines Ltd., a company formed under Wheal Grenville auspices with a capital of £30,000 in 10s. shares. After providing only for the legal and preliminary expenses in forming the company, the whole of the remainder of the subscribed capital will be available for the mine, as there is no purchase money to be paid. The lease is direct to the company from the owner at a minimum rent of £50 merged in dues amounting to one-eighth of the profits, until the entire subscribed capital is repaid in dividends, increased to one-sixth afterward. This mine is situated on a strip of choice tin ground extending for nearly one and a half miles on the run of the lodes, east and west. The property is immediately surrounded by Dolcoath, Wheal Grenville and South Condurrow, which have yielded profits totaling £1,250,000, while the many other mines in the vicinity are said to have given £1,500,000 more. The mine itself, formerly worked as the Great Condurrow under the 'cost book' system to a depth of 300 fm., is said to have paid large sums in profits, until 1873, when it was stopped owing to the drop in the price of tin from £120 to £82. The market, hungry for new business, will keenly watch the progress of this new development in the Cornish tin mining industry, freed from the fetters of the old 'cost book' system. The established mines also under limited liability—Dolcoath, Carn Brea, Tincroft, &c., in which rich finds have recently been reported, are making their place slowly on the London stock exchange. Considering the unlimited quantity of tin said to be awaiting development in that famous district, and the high price of the metal, the progress made is certainly not startling as regards increase of output. In the department of mechanical treatment there is also much to be done, as exemplified by the recovery of tin by the 'streamers'—which in 1904 amounted to 12% of the entire production of the County.

Gallant little Wales has been heard lately bidding for the favor of the mining investor. The St. David's Gold Mines, (1903), Ltd. formed with 60,000 shares of 5s. each, started with £5,000 only for working capital. Previously and under the existing company, this property produced in seven years 101,124 tons of ore which yielded 51,990 oz. bullion, realizing £193,588 at a working cost, not including developments, of £86,155. During 1905 the main lode fell off in output of rich ore, but there is still a large body of ore that can be relied upon for a fair average profit. The chairman, at the annual meeting, said there were many other mines in the country which might profitably find work for miners who are attracted abroad. He lamented the fact that for promoters and the public, distance lends enchantment; out of a list of four hundred Transvaal mines he found ninety were paying dividends; two-thirds of these companies could not rival Wales.

The King's speech has not revived the drooping spirits of the Kaffir market. The letters patent granted for an intermediate stage of representative government are withdrawn and a new constitution for the Transvaal and the Orange River Colony is to be drawn up providing for responsible government. Thus an inevitable delay threatens the South African gold industry. Elections being postponed to December, the legislative assembly cannot meet before February, 1907. Till then licenses for importation of Chinese labor will cease. Meantime it is said outstanding licenses provide for a balance of 10,000 coolies to arrive.

A spurt has occurred this week in Great Boulder Main Reef, Ltd. (W. Australia). After working through a poor zone several hundred feet deep, pay-ore has been struck, likely to be the forerunner of important developments. At the new 1,500-ft. level a cutting put in west from the north drift on the main lode at 90 ft. has pierced the wall for two feet, and the breast is still in ore averaging two ounces gold. This company is an offspring of the Venture Corporation, whose progeny in different parts of the world are going much better than heretofore. Under the present bold and resourceful leadership, the parent company's fortunes are again in the ascendant.

An interesting feature of the Royal School of Mines dinner last week was the presentation of plate with an address and album of signatures from past and present students to Professor Judd on his retirement from the chair of geology. After proposing the toast of the evening—that of 'The School of Mines,' the chairman, Professor S. Herbert Cox, in the course of his speech referred to the much debated scheme for the future of the school. He said he understood the recommendations of the departmental committee (which they would all be pleased to accept) to mean;

(1) The title of the Royal School of Mines is to be preserved.

(2) It is to be one of several schools, such as civil engineering, chemistry, &c., which are to have their headquarters at South Kensington.

(3) Each school is to provide higher instruction, and grant diplomas in its respective subjects.

(4) The diploma is to remain that of Associate of the Royal School of Mines.

(5) As there are a number of preliminary subjects which are common to all branches of scientific education, a knowledge of these must be acquired by students before entering upon the course at the school.

(6) A central institution will provide an approved two years' course which will satisfy these requirements, but this preliminary work can be done elsewhere if more convenient.

TORONTO, Canada, February 28.

The first instalment of the promised legislation respecting mining was presented to the Provincial Legislature on the 26th inst. According to this bill the Department of Lands and Mines will be reorganized, being known in future as the 'Department of Lands, Forests and Mines.' The status of the present Bureau of Mines will be raised and its scope extended by placing it in charge of a deputy minister; Mr. T. W. Gibson, the present director of the Bureau being promoted to that position. The effect of this will be to increase his responsibility and give him a freer hand in keeping with the growing importance of the mining industry. This bill is merely the preliminary to the more important measure promised for some time amending the present mining regulations, which were framed when the mining interests of Ontario were yet comparatively insignificant. The details of the measure have not yet been completed, but some of the leading provisions have been made public. The number of mining divisions will be increased. Under the old system everything was centralized at Toronto. All applications for the location of claims had to be filed here, putting applicants to much expense and inconvenience, and giving rise to charges of official favoritism and the forestalling of claims through political influence. The only exception was the mineral district of Michipicoten, which was set apart as a mining division about ten years ago. Last year the Temiskaming mining division was created, including the Cobalt area, but outside of these localities all proceedings requisite to the taking up and transferring of claims, etc., had to be taken in the department at Toronto. The principle of de-centralization, partially recognized in the cases of Michipicoten and Temiskaming, with manifest advantage to the industry, is to be extended by the organization of four or five other mining divisions with a recording office in each where all applications must be filed. The feature of the measure which gives most satisfaction to miners is that there will be no royalty or percentage tax on the output of mines. A small land-tax will be levied on all claims whether productive or not. The size of claims will be 40 acres, which will be sold at $2.50 or $3 per acre in surveyed districts and at about $2 per acre in unsurveyed areas. In addition to the annual tax, it is proposed to exact certain working conditions as a means of checking merely speculative enterprises. Refining of silver-cobalt and nickel ores will be encouraged by government aid in some form. These are the main outlines of the bill in course of preparation, in which the influence of the mining convention held in December last and the subsequent agitation of the subject by mining men is very apparent.

The spring rush to Cobalt is setting in earlier than was anticipated and large numbers of mining prospectors, speculators and others are already on the ground. Preparations are making for an influx such as has never been witnessed in the history of Canadian mining. Meantime work is being steadily continued at the producing mines and large shipments of ore are being made to New York. The extensive timber limits owned by Gillies Bros., lying immediately south of the mining area, a portion of which is known to be rich in silver ore, have been a cause of much difficulty, as prospectors have been prevented from locating claims on this tract. The limit-holders have no claim except to the timber and arrangements have been made with the Government, under which the mineral-bearing portion of the limit will be cleared as rapidly as possible. Some 800 men are engaged in the work, and in a few weeks the valuable timber will have been removed. This part of the limit will then be thrown open, but the problem which is engrossing the attention of the Government is the manner in which this is to be done. As hundreds of people know the localities where there are valuable mineral outcrops, to throw it open for prospecting in the ordinary way would result in a general scramble for priority, entailing possible violence and bloodshed and certainly endless confusion and disorder. A suggestion much favored is that the Government, in view of the special circumstances of the case, should depart from the usual practice and dispose of these locations at public auction.

The question of the treatment of the Cobalt ores in Ontario, or at least under conditions which will secure to the shipper larger returns than are obtained at New York, is in a fair way of settlement. W. G. Trethewey, one of the largest Cobalt mining operators, and John McMartin, of Cornwall, are organizing a company to establish a silver refinery at Hamilton, Ontario. They have secured the property of the former Hoepfner Refining Co. in that city, and will treat ore by a process in use in Saxony, Germany, which has proved satisfactory. Experiments undertaken in the smelting of Cobalt ores in England have yielded encouraging results. A well-known firm secured a trial shipment of 20 tons of ore and has made an advance payment of £100 per ton, promising further remittances as other valuable constituents are extracted from the ore. This encourages the hope that a market can be found in England in which the value of the nickel, arsenic and cobalt in the ore, now largely ignored by New York buyers, will be recognized.

DENVER, March 6.

A great deal of unfavorable comment is heard concerning business conditions at Cripple Creek, which in the main is both thoughtless and unjust. Like every other mining camp, Cripple Creek was commercially overdone in nearly every branch of business and the general re-adjustment that is now taking place is misunderstood. The district has a total estimated population of over 20,000, less than one-fourth of which is employed in the mines. The men are saving their money. 'High grading' (ore stealing) has been weeded out, to a large extent, and while it can never be known how much was extracted from the mines in that manner, it was surely the source of a part of Cripple Creek's apparent business prosperity. The 'high-grader,' as a rule, lives on the fat of the land; he is a good spender and his social status depends more upon the moral atmosphere of the camp than upon his proclivity to annex a part of the pay-streak. A prominent business man of Cripple Creek recently said that about 10,000 people would represent the future permanent population of the district. The camp may shrink to that number, but its actual resources warrant the opinion that it is sure to grow in population again. The mine-owner is no less a 'kicker' than the merchant, but he lays the cause of all his woe to the 'smelter trust.' Whether his trouble is real or imaginary, it has developed a seemingly fixed purpose to adopt new tactics, which, if carried out, will have a far-reaching effect on the future of the camp. While there is no concerted movement, there is a general intention and preparation to treat all ore locally or by works controlled by the mining companies. Cyanidation is the process most likely to be generally used though the bromine treatment is also favored by a few. The great drawback to local treatment by cyanide is the cost of roasting; however, there is an immense tonnage of oxidized ore yet to be worked.

The Portland mill, near Colorado Springs, and the Economic mill, of the Woods Investment Co., both chlorination works, have been running successfully for a number of years. Of the older mills in the district, owing to fire and removal, scarcely a vestige remains. The Copper Mountain mill and the plant built at Gillette last year are both idle. The Homestake mill is closed, while situated close to it, the Ironclad Mill Co., with its 100-ton plant, commenced to treat custom ore the first of this month and is planning to increase its capacity to 150 tons per day. The Wild Horse mill is not credited with any great success. The old Van Fleet sampling works at Goldfield has been converted into a cyanide mill and is running successfully on custom ore. The mill at the Los Angeles, destroyed by fire some time ago, is not likely to be rebuilt. The Santa Rita mill, treating the ore of that property exclusively, is being doubled in capacity. The new mills now under construction are the Golden Cycle, at Colorado City, the Pony gulch mill, of the Little Giant Mining & Milling Co., and the Mineral Hill plant, of the Wishbone Gold Mining Co.

Among the smaller mills, that of the Anaconda is perhaps the most noteworthy. It has a daily capacity of 100 tons and is conducted by Dr. Pascal Craig, one of the owners, who has finished a successful run of several thousand tons of surface and dump ore from the Anaconda's property. The mine management states that the average value of the ore treated was $3 per ton, and that this was handled at a profit. Dr. Craig is now arranging to treat custom ore.

The Pony Gulch mill, with a capacity of 200 tons, was nearly completed when destroyed by fire on January 13. It is now being rapidly re-constructed for a 400-ton capacity. It is designed to treat ore belonging to the company; however, it is the intention of the management to increase the capacity later to 1,000 tons and treat custom ore, should the first installation prove successful. Some of the mills of the district are idle, and to understand the reasons would be to learn the inside history of the companies and the men who built them, to sift out the stock schemes from the sane enterprises and to know of mistaken ore values. New mills are being built and others are projected by the hard-headed men interested in the district, with no ulterior motive than to gain profit from custom work. Notwithstanding the number of mills that are built not to run, there are a large number of legitimate enterprises on foot, which, when carried out, will make a new camp of Cripple Creek.

The open rates of treatment levied by the 'trust' mills are: A minimum of $5 for ore having a valuation up to $10 per ton; $6.50 for ores having a valuation of $20 to $25 per ton, with a minimum railroad freight of $1 per ton. Your correspondent is not at liberty to mention names or give full data, but he has seen a contract, given by one of the local concerns, which nearly cuts the fixed charges in half. Counting the entire fixed charges—that is, wagon haul, sampling, railroad freight

and treatment—the outside mills would have to cut their treatment charge from $5 per ton to $1.70 per ton, on the minimum, to meet the figure. If the oxidized ores can be treated at so low a rate, making an actual difference of $3.30 per ton on $10 ore, the roasting question does not look so serious, and it requires no great foresight to see that eventually the contest will be between mine-owners and railroads, instead of owners and the 'trust.'

The partial closing of the Findley Consolidated Mining Co.'s mines on the first of this month is by no means construed to mean that these mines are out of ore, but that the Findley Co. is looking for better treatment rates, and it is reported that, hereafter, its output will go to the Golden Cycle mill. During the time which will intervene before the completion of that mill, or until the Findley secures another equally good contract for treatment, a small force will be kept on development work.

SALT LAKE CITY, March 5.

The stockholders of the Bullion Beck & Champion Mining Co. have elected a new board of directors to serve during the ensuing year, which has organized with Philo T. Farnsworth, president; Joseph F. Smith, vice-president and treasurer; M. C. Morris, secretary; who, with James A. Cunningham, Philo T. Farnsworth, Jr., H. C. Lund and S. W. Riter, constitute the board of directors. All excepting the latter are of Salt Lake. The company's mine is one of Tintic's oldest producers, and is worked principally by lessees.

The shipments of ore from Park City the past week aggregated 5,224,000 lb., as follows: Silver King, 2,139,000; Daly-West, 1,150,000; Kearns-Keith, 86,000; New York Bonanza, 100,000; Daly-Judge, 1,218,000; Daly-Judge (zinc middling), 531,000.

At the Skylark copper property in Beaver county a winze from the main tunnel has broken into copper pyrite.

Developments at the Silver King Consolidated at Park City are being watched with interest. The double-compartment shaft has cut a mineralized ledge. The formation is similar to that in the old Silver King.

The management of the Galena King mine at Stockton has resumed development and will drive the Honerine drain tunnel to connection with the main lode. The Galena King Co. has done little to develop its property since the formation of the Honerine Tunnel Co., in which it is interested, which project was undertaken to drain the principal mines of the camp. The Galena King Co. has $100,000 in the treasury with which to prosecute exploration.

The new equipment at the Yampa smelter in lower Bingham canyon, in process of installation, will soon be completed. The equipment consists of a second reverberatory and eight McDougall furnaces. These will probably go into service in April.

The management of the Century mine, in the Park Valley district, Box Elder county, reports that the mill at that property will begin crushing in May. The company has employed the past year in the development of the mine. A crosscut run to the north has opened milling ore.

The mill and electric-power plant of the Sevier Consolidated Mining Co. in the Gold Mountain district are working satisfactorily.

A new mining camp, Gold Butte, situated in the extreme southeastern portion of Lincoln county, Nev., is attracting attention at Salt Lake. About a year ago a syndicate of Salt Lake men sent a prospecting party to Nevada in charge of J. F. Gibbs, who had been mining in the Gold Mountain district, Utah. Mr. Gibbs went into the St. Thomas mining district, 45 miles south and east of Moapa station, on the main line of the San Pedro, Los Angeles & Salt Lake railroad. He found ledges showing free gold on the surface and located a group of mining claims and also a spring, explored the veins, which were from one foot to 15 ft. in width, carrying streaks of high-grade gold ore. Late last fall, another outfit, in charge of W. C. Sharpe of Tucson, Ariz., came in and located an adjoining group; still later, a syndicate of Kimberly, Utah, citizens, mostly officials of the Annie Laurie mine, who had heard of the new district, sent in another outfit, which secured promising locations. During the past few weeks others have gone into the region. Application has been made to the Postoffice Department for a postoffice, to be called Gold Butte, with semi-weekly mail service. Several companies have been formed and are actively developing, it is said, with satisfactory results. The Gold Butte Co., formed to take over the Gibbs locations, is getting out a high-grade shipment, the ore having been taken from open trenches. A general store has been established.

The City Rocks mine, at Alta, is shipping, and during the week marketed a carload that showed 7% copper, 20% lead, 20 oz. silver and $1.60 in gold.

The Holland Gold Mining Co., developing a property near the Sevier Consolidated, in the Gold Mountain district, Utah, will soon put in a compressor. Gideon Snyder, of Salt Lake, is secretary.

The smelter of the Utah & Eastern Copper Co., at Shem City, Washington county, is in operation. Early last year the mine ceased production, owing to the caving of the main shaft, which was so badly damaged that the management decided it would be more economical to drive a tunnel, cutting the orebodies lower. This was done and recently connection with the old workings made. The property is in shape for steady production.

The experts of F. Augustus Heinze, who have been investigating the Dalton & Lark mines at Bingham, operated by the Bingham Consolidated Mining & Smelting Co., have finished their labors and are at the Eagle & Blue Bell mine, the Bingham's Tintic possession. The work of the Heinze men at the Dalton & Lark has been checked up by Robert C. Gemmell, general superintendent of the Utah Copper Co. These examinations are supposed to be in the interest of Thomas F. Cole and associates.

The Pittsburg Consolidated Mining Co., at Alta, has a bond on the property of the Pioneer Mining Co., at Alta, which owns a tunnel site. It is proposed to extend the tunnel, now 400 ft. in, to the Pittsburg orebodies, which will be cut at a depth of about 900 ft. under the present workings.

The Swansea mine, in the Tintic district, is sending to the smelters 1,000 tons of argentiferous iron ores monthly. An official of the company has stated a dividend will be announced during the month.

The Alexander group at Stockton, recently purchased by a Salt Lake syndicate, will form the basis for a new company to be organized. The property adjoins the Black Diamond.

Late developments at the Odin mine at Park City indicate that the camp is going to have another shipper. A drift to the west has opened into a shoot of ore that has a gross value of $60 per ton. The property is owned largely by Park City men, among them being Henry Walsh and Peter Kaas.

The Ohio copper mine in Bingham is being examined by W. H. Wiley and assistants for Samuel Newhouse and the Venture Corporation of London. F. W. Baker, representing the latter as chairman of the executive committee, conferred with Mr. Newhouse recently about the property.

The monthly payroll of the Tintic district aggregates about $95,000.

At the Utah-Apex mine in Bingham last week, an important strike of copper ore, of shipping grade, was made in a drift west from the Parnell tunnel level.

The recorder of Utah county has filed a deed from E. W. Clark, as receiver of the Overland Gold Mining Co., to Denman Blanchard of Boston, the consideration named being $37,500. This property is situated in the Camp Floyd mining district and the orebodies are being opened by a new shaft, preparatory to the starting up of the mill. The ore is low grade and can be treated successfully by the cyanide process.

Articles of incorporation of the Ogden Leasing & Development Co. have been filed. The directors are C. H. Hussey, Parley M. Parry, Francis L. Woods, John J. Schwartz and S. L. Ives, all of Ogden, Utah.

Details are being arranged for a bond issue for the Bingham Central Mining Co. at Bingham, which is to be the scene of a vigorous campaign shortly.

The stockholders of the Mammoth Mining Co. will meet in special session on the 31st inst. for the purpose of discussing and deciding on the matter of re-incorporating the company, this time under the laws of Nevada, instead of Utah, as at present. It is planned to have 1,000,000 shares of the par value of $1 each; 400,000 shares to be issued to the present shareholders and the balance to go into the treasury. The officers of the company desire to get the advantages of the Federal courts in event of litigation.

Tintic district mines shipped 183 carloads of ore to the Salt Lake smelters last week. The shippers and amounts being: Dragon Iron, 10; Beck Tunnel, 9; Eureka Hill, 16; Eagle and Blue Bell, 8; May Day, 3; Brooklyn, 3; Swansea, 5; Uncle Sam, 4; Yankee Consolidated, 6; Bullion Beck, 13; Gemini, 30; Ridge and Valley, 3; Centennial Eureka, 45; Ajax, 5; Black Jack, 4; Carisa, 4; Lower Mammoth, 2; Mammoth, 13; Victor Consolidated, 1.

HELENA, Mont., March 5.

Mining in this part of Montana is more active, and gives better promise than for several years. The camps tributary to Helena are small and scattered; but in the aggregate there is more ore shipped, and larger returns from ore milled within a radius of 35 miles, than for the past six or seven years. Prospecting and mining development have not been so great as to cause anything in the nature of a boom, but steady, determined effort to develop mining resources has been made with substantial returns.

Perhaps the most important mining operation near Helena is the revival of the old Whitlatch mine at Unionville, four miles south of Helena. Nearly two years ago work of development was begun on this old bonanza, after an idleness of 27 years. The new 20-stamp mill, driven by power electrically transmitted, has been built, and was put in operation January 1 last. This mill is now running steadily and producing a goodly amount of gold bullion, which favorable result is likely to stimulate the re-opening of other gold-quartz mines at Unionville.

The Spring Hill mine, owned by the Pittsburg & Montana Copper Mining Co., situated one-half mile north of the Whitlatch mine, is making regular shipment of 50 tons daily to the Butte smelter of said company. The ore is pyrrhotite, and in addition to its value for fuel in the smelter, carries enough gold to pay mining and transportation charges.

At Rimini a number of leasers are working and small shipments of high-grade silver-lead ore are coming in from time to time to the East Helena smelter.

The M. & M. mine on the porphyry dike, nine miles from Rimini, has recently finished a 10-stamp quartz mill and is doing very well with the prospect of an enlarged plant at an early date.

The Bullion mine on Cataract creek is furnishing ore to its concentrator and it is reported that eight miles of railway will be completed during the coming summer to connect its smelter with the Great Northern railway at Basin. The same line of railway may later extend up Cataract creek and northerly across the divide and down the Blackfoot to a connection with the Northern Pacific railway at Elliston. This enterprise, if completed as promised by its promoters, will be the means of opening up an extensive mineral district. A large number of mines, from 10 to 14 miles south of Elliston, have produced in the past considerable quantities of shipping ore, but these mines now depend upon the large tonnage of concentrating ore which can be furnished as soon as transportation facilities are afforded.

The district to the north of Elliston, of which Silver Camp is the center, is active, and much larger shipments during the coming summer are promised.

In the immediate vicinity of Lincoln, a gold-milling proposition, owned by John A. Rowand, is being developed and milling operations on a small scale will begin early in the spring.

That well-known producer, the Jay Gould mine, has been sold to Chicago capitalists by A. W. Martin. This sale will mean an immediate resumption of milling operations in the company's 30-stamp mill, which has been idle since the latter part of December pending this sale. The price is stated to have been $450,000. The Jay Gould has always been recognized as one of the paying mines of this section. For a number of years it was operated by Helena men. It is a free-milling gold proposition. The last clean-up is stated to have yielded $27,000. The new corporation will be known as the Gould Mines Co. The men principally interested in the new concern are large holders in the Whitlatch Co., which is successfully operating the Whitlatch-Union mine near Helena. Canoll & Martin are also interested in the new company. F. A. Ross, of Chicago, will be general manager of the company, and F. L. Sizer, of Helena, will be consulting engineer.

At Elkhorn the Iron mine, owned by John Rothfus, continues its regular shipments of iron ore to the smelter, and a large body of pay-ore has been developed at this property. The Elkhorn mine, owned or controlled by J. H. Longmaid, will resume operations very early in the spring, the higher price of silver making it possible to mine this ore at a profit, and considerable development work in the camp is anticipated.

Numerous small silver-lead mines are being operated in the Basin and Cataract districts, and also near Wickes, so that the aggregate shipments reach a much higher tonnage than for the last six or seven years. Some attention is also being paid to the zinc content of the ores, and it is probable that when cheap transport is afforded by the completion of even a portion of the Basin & Elliston railway, some reduction plant capable of saving both the lead and zinc will be installed at or near Basin.

The fact that a larger market for electrical power is now assured explains the desire of the Missouri River Power Co. to complete its second dam, now under construction on the Missouri river, 17 miles north of Helena. Of course it is known that by far the larger part of this power will be consumed in Butte, but there is great encouragement to the smaller mining operations in this vicinity, because of cheap and suitable power, which can be furnished by the Missouri River Power Co. next fall, when its second dam will have been completed. The old plant at Canyon Ferry develops and transmits 10,000 h.p. and the new plant will produce 15,000 h.p. Several of the smaller companies operating within reach of these two power plants are considering the building of their own transmission lines and installation of electric power as soon as it can be furnished from the new dam.

The Winston district, 20 miles east of Helena, is receiving considerable attention. The H. & H. mine, closed down for many years, was re-opened about a year ago and very good results from new development are reported. The company operating this mine is sinking the main working shaft deeper and also sinking another working shaft on a parallel vein, and the mine will become a regular shipper again as soon as this shaft work is completed. The East Pacific mine, in the same district, is running its 50-ton concentrator on the old dumps of second-class ore, and making shipment of concentrates to the smelter at East Helena. Work of mine development will be resumed here in the near future.

ALASKA.

The Rosella Hydraulic Mining & Development Co. will dispatch its first crew of men from Victoria, B. C., to Rosella Creek, near Wrangel, about March 1. The machinery for the company's hydraulic plant was taken in last year and will be set up as soon as the snow disappears.

F. C. Hammond and others have located 1,000 miners' inches of water at Sheep creek, near Juneau, for the purpose of developing electric power for mines in the Juneau district. Mr. Hammond reports having contracted to supply the Alaska-Perseverance Co. with power.

The Conrad Consolidated Co. is preparing to build a surface tramway from Windy Arm to the Venus mine at Conrad, near Skagway. —— Work will begin on the Dail group, at Conway, and on the Ruby claim, about March 15.

Bedrock has been found at a depth of 65 ft. on No. 8, at Cooper gulch, near Nome.

F. McIntosh and others, owning a number of claims on the tundras on Penny river, near Nome, have let a number of lays on the property and prospecting is going on.——Bayles & Wentworth and Sinclair & Johnson have sunk holes to bedrock near Nome and are planning to instal machinery if the present pannings hold out. ——Mr. Ivey, formerly collector of customs at Juneau, is prospecting with a large force and steam thawers on a claim near Penny river at Nome. Several holes have been sunk to bedrock.——Mr. Stout and party are prospecting near the foot of Jess creek, in the Nome district.——The Bartells Tin Mining Co. has awarded a contract to L. Meyers for the construction of a 4 by 7-ft. tunnel through a hill of granite to reach its tin ledge in the Cape York district.——The Wild Goose Co. is doing considerable winter work in the Council district, near Nome.

ARIZONA.

Cochise County.

The Saginaw mine, near Douglas, will be unwatered and drifting commenced on the 900-ft. level. The new pumps are in place.——The main shaft of the Shattuck & Arizona mine, near Douglas, is being enlarged and will be equipped with a new hoist and compressor.—— The Naco Smelting & Refining Co. has contracted with the citizens of Naco to begin work on a smelter of 250-tons capacity at Naco before April 1.——M. Carter has bought at sheriff's sale the property of the Dragoon Mining Co., in the Dragoon mountains, near Douglas. ——A large Nordberg hoist was installed last week at the Junction mine, near Lowell. An 85-ft. steel gallows frame is arriving and will be set up when all the parts have reached the mine.——It is reported that the Sullivan Copper Mining Co. will instal pumping machinery at the Sullivan group, near Paradise.

The Bisbee miners on the 5th inst. voted on the question of organizing a local union of the Western Federation of Miners in Bisbee. The vote stood 2,200 against the union proposition and 428 in favor, practically every workingman employed by the Bonanza Circle Co. and the Copper Queen voting. The election was the result of the efforts of an official organizer for the Western

Federation of Miners, who has been here for two months encouraging the union movement. A mass meeting of miners held at the Opera House last week decided to leave the question to a vote of the miners. The miners at Bisbee receive union wages.

C. L. Andrews has purchased 150 mules to be used in hauling ore from the Transvaal Copper Co.'s mine to its new smelter, at Cumpas.

Gila County.

It is given out that the fire in the Interloper shaft on the Old Dominion mine at Globe has been smothered. A new furnace has arrived for the Old Dominion smelter. ——Work has been commenced on the Iron Cap mine, near Globe. The shaft will be sunk 600 ft.——Machinery has arrived for the concentrator for the Pinto Creek Mining & Smelting Co., of Globe.——The new converting plant on the Shannon mine, near Globe, was put in commission last week.

Graham County.

S. S. Campbell, of the Naravilla Mining Co., is in Solomonville to open the company's mines, eight miles north of Solomonville. —— C. E. Stevens, of the Columbus Copper Co., has let a contract to drive a tunnel an additional 500 ft. at the company's mines, near Clifton.

Mohave County.

F. Vasquen, of the Argo mine, near Kingman, states that work will be resumed at that mine within a few days.

Pinal County.

The old smelter at the Ray mine, at Kelvin, was burned a few days ago. The smelter was erected 10 years ago, but was never operated.——The Big Lead Mining & Smelting Co. is figuring on the building of a concentrating plant near Ray.

Machinery is now on the ground for increasing the capacity of the Desert Queen plant, at Casa Grande, to 30 tons, the present capacity being about 15 tons. A Tremaine mill for the treatment of slime and additional cyanide machinery are to be installed. Work is to be started on a double-compartment shaft, the previous work having been entirely on the surface.

Yavapai County.

D. E. Andrews and E. T. Frank have concluded the purchase of the Tam O'Shanter group of mines near Crown King.

The Rigby Mining & Reduction Co. is making preparations to start its new plant, at Mayer.——The Treadwell smelter, near Mayer, will begin operating at full capacity shortly.

John Kinney and E. F. Cullerton are preparing for the development of the Kinney mine, in the Big Bug district, near Poland.——A. L. Lee and John Harlan have purchased the Hopper group, on Cherry creek, near Prescott.

W. J. McMahon is installing new machinery for the Pittsburg-Jerome Mining Co. at Jerome. —— J. T. Neff, president of the Goddard Mining Co., has purchased five claims between the Oro Grande and the Goddard properties, near Prescott. —— H. A. Mills, of Colorado, has purchased the American Flag, Morning Star and Davis mines in the Big Bug district, near Prescott. Lumber has been ordered for camp buildings. Hoisting and other machinery is to be installed.

The French Lilly mine, at Crazy Basin, near Prescott, is being unwatered.——A 35-h. p. engine and a 150-h. p. gasoline engine are being installed on the Rincon properties, near Congress. Development will be delayed until the larger engines are installed.

CALIFORNIA.

Alpine County.

The holdings of Mr. Curtz at Loope have been sold to Reno parties, who, it is reported, will spend $100,000 on developments.

Amador County.

The engine and boiler at the Phœnix mine, near Wieland, have been sold to John Strohm of Jackson.—— Since the breaking of the shaft at the Mitchell mill, near Jackson, only five stamps have been running.—— The mill at the Jose Gulch mine at Butte City, near Jackson, is being put in order.——The Treadwell mine, eight miles east of Sutter Creek, is to be equipped with a 10-stamp mill.——Mr. Helm has let a contract for sinking on his mine near Ione.——J. Whaley is to resume operations on the Taylor Slide mine at Fort John, near Jackson.——J. Troax and Wm. McVay have begun operations on their placer mine at Fort John.

Butte County.

J. W. McFarland and E. Thatcher are preparing to begin development work on the J. M. Hutchinson claim, on Little Butte creek, 12 miles from Chico.

Calaveras County.

The Chris Anderson drift mine, near San Andreas, together with the machinery at the mine, is advertised to be sold at commissioners' sale, on March 19, to satisfy a judgment of $569.35.

Fresno County.

The Copper King Mining Co. has contracted with the San Joaquin Light & Power Co., of Fresno, for power to be supplied to the company's mines, east of Fresno, over a long-distance transmission line.

Inyo County.

Flynn & Levi report having sold their half interest in the Augerbury holdings in Wild Rose canyon near Ballarat. The new owners have guaranteed to expend $35,000 in development, to put in a 10-stamp mill, and to pipe water to the mine.——The tunnel on the Harris claim in Wild Rose canyon, near Ballarat, has been completed to the distance of 150 ft.——The Golden Key Mining & Milling Co. has purchased 23 claims from E. F. Koster, J. R. Ingram and others, in the Wild Rose district near Ballarat. The new owners will continue development on a portion of this property.

The Mt. Whitney Mining Co. is putting its mill in shape, at Lone Pine, near Independence, and will begin operations shortly.

Kern County.

(Special Correspondence).—F. A. Fickert of Bear valley, near Tehachapi, has returned from San Francisco, where he closed the sale of his zinc mine, which has been under consideration for some time. The development of the property will be begun as soon as possible.

Tehachapi, March 4.

R. L. Deakins and P. J. Bresnaham, owners of the Fairy claim in Fiddler's gulch near Randsburg are shipping in men and supplies and will begin development.—— The Zenda mill near Amalie, to which 10 stamps have been added, started up last week.——H. H. Blood and others of Bakersfield will begin operations at the mill at the Gold Peck mine about June 1. Twenty carloads of machinery have been taken to the property.

Charles Taylor and Henry Giondoni have leased the 600 ft. of the east end of the Little Butte mine, at Randsburg, to January 1, 1907, including the machinery, shaft and buildings.

The Butte mine is working in rich ore at a depth of 225 ft. The deepest shaft on the mine is over 600 ft. and shows valuable ore at the bottom.

C. S. Pillor, manager of the St. Elmo mine, near Randsburg, reports that they are drifting at the bottom of the 265-ft. shaft to prospect the vein.

Mono County.

The Standard company at Bodie is developing the new strike made some weeks ago in ground known as the old Bodie mine.

Nevada County.

The Posey Canyon Gravel Mine Co. has secured a bond on the Mother Mitchell claim west of Grass Valley and will run a tunnel to tap the channel.——The Ethel mine in God's Country near Grass Valley has been partially closed down on account of the shortage of fuel. The drift in the mine is being extended.

Work is to be resumed on the Deadwood mine, near Nevada City. Manager Esselstyn is in San Francisco completing the preparations. The tunnel has been cleaned preparatory to extensive operations.——Frank Ensensperger has assumed the management of the Union Hill mine, near Grass Valley, which was sold a few days ago. The leasers, who have been working the mine, have been stopped and the new owners will begin sinking and drifting.——It is reported that a six-foot ledge has been encountered in the extension of the shaft of the Central mine, near Grass Valley.

An ore shoot assaying $200 in gold per ton is reported in the Union Hill mine. The vein is 24 in. wide. The ore is white and contains a large quantity of pyrite and free gold. The mine was recently purchased by San Francisco and Los Angeles capitalists, who took over the lease from the men working it, paying $3 a day for the time the leasers had put in. The leasers were drifting toward this ledge when the mine changed hands, and were only a few feet from the shoot. The purchasers have made arrangements for a new mill, and a large force put to work. A shaft is to be sunk.

The Home mine will be closed down, owing to the Champion-Home litigation set for trial on April 10. The Home people announced that they intended to close down as soon as the case should be set for trial and that the mine would be kept closed until the termination of the trial. For that reason they asked that an early date be named. The trial, it is thought, will occupy several months.

Riverside County.

Frank Cram and J. H. Patee have returned from San Francisco, where they purchased a 25-ton mill for the Brooklyn Mining Co.'s mines, at Dale. The mill is expected to be in operation by April 1.—— The Gold Quartz Mining Co. is sinking a 500-ft. shaft on one of its claims, 18 miles from Dale.

The Borland Mining & Milling Co. has contracted to sell its claims in Silverado canyon, 22 miles east of Orange, to C. D. Maze and a French company, who agree to do 1,000 ft. of tunneling within six months. A 42-ton concentrator, operated by gasoline, is now being put in.

Placer County.

Forty more stamps will be added to the 20 stamps now in operation at the Three Stars mine, seven miles west of Auburn. While these are being added new levels will be run.

The Buckeye mine, near Forest hill, will be re-opened. ——The Baltimore mine, at Forest hill, has been practically closed down to permit of extensive repairs and development.——The Proper Fraction quartz claim, in the Canada hill district, northeast of Forest hill, is advertised to be sold at sheriff's sale, on March 24, to satisfy a judgment of $1,779.69.——The Polar Star hydraulic mine, at Dutch Flat, is to be re-opened under new management. The mine has been closed since last spring. Preliminary work is now being done.

Vail & Burton report having sold the Burton mine, two and one-half miles east of Rocklin, for $7,000.

Plumas County.

(Special Correspondence).—G. S. Tyler is developing two ancient gravel channels near Quincy. These channels have a difference of 300 ft. in elevation, the lower containing 'blue' gravel, the material being largely volcanic, boulders, cobbles, sand, etc., with some slate and quartz. The prospect in this channel is said to be promising. The upper channel has as yet little development. There are many miles of lava-capped channel in this section of the State which have not been explored. The work under the direction of Mr. Tyler is on both sides of the middle fork of Feather river, above the mouth of Nelson creek. The modern streams and their bars were worked in the early '50s. Nearly all the ancient channels are in the forest reserve.

Quincy, March 4.

San Luis Obispo County.

Another shaft will be sunk at the Klua quicksilver mines, near San Luis Obispo.

Shasta County.

Walter Van Matre, superintendent of the Washington mine near French Gulch, begun drifting on the new 200-ft. tunnel last week. He reports that additional stamps will probably be placed in the company's five-stamp mill soon.——B. F. Rodgers of the South Fork mine at Igo has encountered the Pilchuck ledge at a depth of 300 ft. He will now begin a raise to strike the Chicago ledge.

E. Newhouse, of the American Smelting & Refining Co., has been made manager of that property at Balaklala, near Kennett.——P. Ramsey, of Kennett, reports having re-opened an old prospect about three miles from Kennett.

Siskiyou County.

The Yreka Creek Gold Dredger Co., which has been drilling prospect holes near Yreka, has definitely located the Bed Rock at a depth of 30 feet.

W. H. Young, of the King Solomon mines, near Etna, reports having reached a ledge last week. He states that a larger force will be put on.

Trinity County.

F. P. Burris, owner of the Bear Tooth group at New River, has purchased an 8-h.p. gasoline engine to be used in operating a new aerial tramway.

Tuolumne County.

The proposed new three-compartment incline shaft at the Rawhide mine, near Sonora, will be sunk 800 ft. north of the old shaft. —— Work on the old shaft at the Hazel Dell mine, northeast of Columbia, will be abandoned, as the low-level crosscut which will be run to tap the vein 600 ft. below the old workings will do away with pumping and hoisting. This crosscut will run about 800 feet.

At present 260 stamps are dropping on the Mother Lode between the Stanislaus and the Tuolumne rivers. These stamps are distributed as follows: The Clio mill, 10 stamps; Shawmut, 100 stamps; Jumper, 20 stamps; Santa Ysabel, 10 stamps; App, 60 stamps; Dutch, 20 stamps; Rawhide, 40 stamps.

The vein in the north and south drifts on the 600-ft. level in the Draper mine near Soulsbyville is reported showing a large vein of good ore.

A. A. Irish of Los Angeles, the principal owner of the Black Hawk mine near Soulsbyville, reports good ore in the shaft.

J. W. Classen, secretary of the Mohican Mining Co., says that the Mohican mine, near Groveland, will resume operations shortly. The company has been doing development and good ore has been found.

Jasper Bros. of Confidence have a contract for the cutting of several thousand cords of wood for the Confidence mine. The mine has been kept unwatered and a few men have been at work on development.

S. A. Knapp has put a force of men at work on the Nelson Gravel mine, at Douglasville, near Columbia.—— W. A. Nevills is preparing to sink a three-compartment shaft to a depth of 2,000 ft. at the north end of the Rawhide mine.——Drifts to a distance of 350 ft. have been driven along a vein at the 200-ft. level in the New Calico mine, near Sonora.——The Golden Gate mining properties, south of Sonora, were sold last week at a commissioner's sale to the M. McCormick Co. for $35,000 to satisfy a judgment held by the purchaser for about $30,000.——Manager Phipps, of the Columbia mine, near Columbia, is in San Francisco making arrangements for the re-opening of the mine.——J. H. Smith has deeded to W. R. Carter all the mineral veins on the property of G. Sivori, at Cherokee gulch, near Sonora.

COLORADO.

Clear Creek County.

Stevens & McGrath have put the workings of the Mendota mine in good shape and the mill is making a larger production than ever. Three cars of zinc concentrates were sent out early last week, and regular weekly shipments are now made.

President William Rogers, of the Santiago Consolidated Mining, Milling & Tunnel Co., is having the mill at Georgetown remodeled and new jigs, tables and another Huntington mill added, which will increase the capacity of the mill to 50 tons per day.

Bloch, Kirby & Co., working the Fort Dodge group in Leavenworth gulch under bond and lease, are drifting on mineral in three lodes, in one of which they have solid ore. The property had lain idle for nine years when the lessees took hold of it, and the first day's work opened up a streak of mineral.——McCluskey & Co. shipped five tons of ore from the Colorado Central mine during the past week, for which they received $827.30. The ore carried 268 oz. silver to the ton. Sifletti & Co. made a shipment of several tons of ore that carried 216 oz. per ton. It is stated that they have two feet of this ore. The Haggart & Co. lease is reported the best in the mine. J. Raymond and F. McCluskey took a lease on the 850 level a few days ago.

Gilpin County.

During the past week the shipments from Central City to outside points included one car of smelting ores from the Concrete and one car of slag to the Globe smelter in Denver, one car of smelting ores to the Argo plant from the Druid Mining Co., and two cars of concentrating ores from the Pozo mine in Nevada gulch to the Newton mill in Idaho Springs.

During the last week of February shipments of smelting and crude ores, tailing and concentrates from the Black Hawk depot to Denver smelters and outside points were 965 tons, making a total for the entire month of 4,785 tons. This was in excess of January about 500 tons.

The Pendleton mine in the Russell district, west of the town, is to be started up by A. A. Johnson, of Denver, under a lease and bond. The main shaft is down 160 ft. and Stroehle & Sons have taken the contract for the installation of a 6x8 friction hoist and a 25-h.p. boiler. A new shaft building will be erected.

The Perrin mine, in the Russell district, has been making shipments to the concentrators at Idaho Springs. The property is being operated under a lease by Jones & Jones, of Russell Gulch.

It is reported that work is to be resumed on the Pueblo lode, on Griffith mountain, owned by Pueblo people.——The Waldorf has made a shipment of 69 tons of concentrates that carried from 40 to 55% lead, 35 oz. silver and a little gold.——Teagarden & Co. have made a shipment from the Sunburst mine of a car each of first

and second-class ore. —— S. Griffin has shipped a wagon load of 244-oz. ore from the Seven-Thirty. It is reported that two additional leases on this property have struck it.

Glanville & Peeck have finished their contract on the Fairfield mine. The property is in Russell district and is owned and operated by Baltimore, Md., people. The main shaft is down 675 ft., and Superintendent Williams has put on two shifts to take out the water.

Stephenson, Hawn and Horning have started their new stamp mill up Moon gulch. The mill is equipped with 10 slow-drop stamps, each weighing 700 lb. The mill was built especially to handle the ores of the Smuggler. A tunnel has been run 250 ft. in the Smuggler, showing a vein which averages 3 ft., and a large amount of free-milling ore has been broken. The free-milling quartz shows $20 per ton.——It is reported the Victoria mine in Lump gulch will resume.——The force at the Perigo on Gambell gulch has been increased, 20 men being at work in the tunnel, all of whom are on lease. During the last run of the Perigo mill 800 tons were treated. A carload of smelting ore shipped by Casagrande & Company is reported to have brought returns of two ounces gold per ton.

Gunnison County.

The new strike recently made on the Golden Islet was of a blind vein encountered in a drift 29 ft. west of the main vein. The ore is four feet wide and assays gave from $8.62 to $47.90. On the foot-wall a streak four inches wide assays $142 per ton. Next to this is an eight-inch streak of 3½% copper ore. Geo. Brant has placed the Islet property. They will drive the cross vein to strike the Montezuma vein which carries high values on the surface. A new hoisting plant will be put in and a double-compartment shaft will be sunk to intersect the Golden Islet vein, Montezuma vein and the blind lead mentioned. It is also the intention to enlarge the mill to at least 100 tons.

Lyons and Black at Pitkin are planning to put a hoist on the Grand Prize. Good ore is still being taken out and regular shipments made.——Several men are employed on the Chloride on development and taking out ore which is being hauled to the mill at Pitkin.——The Cortland property in McIntyre gulch is being operated by leasers, and high-grade ore taken out and shipped.

Lake County.

(Special Correspondence).—Mining here is hampered by lack of facilities for treating ore. The Arkansas valley plant of the A. S. & R. Co. is undergoing improvements to increase capacity, and which will relieve the congestion in the district. There is also talk of several new mills going up, which will help out. There is a great deal of complaint about the mines of the district being obliged to curtail production. Many of the leasers are making good money.——It is reported that the Yak Tunnel Co. has purchased the Diamond property, which is considered valuable ground, and that their tunnel will be extended to that mine. Should the report prove true, it will mean the unwatering of a large territory which at present cannot be worked on account of the large volume of water. To reach the Diamond property the tunnel will be driven over a mile further than the present terminal at the Ibex.——During the coming summer Leadville will see renewed activity.—— The Damascus Mining & Milling Co. is completing a 50-ton mill for handling zinc ores from the A. Y. & Minnie mine, now controlled and operated by the Western Mining Co. The mill will contain six Blake-Morscher electrical separators.

Leadville, March 8.

The Damascus mill, at the foot of Leiter avenue, Leadville, should be running by March 10. Some delay has been experienced owing to slow delivery of machinery. ——Mr. Burdette's mill, on the site of the old Tabor mill, in California gulch, is ready for the machinery. Both of these milling projects are to some extent experimental and anticipate enlargement, if successful. The supply of ores available for both is sufficient for larger plants.

San Juan County.

Two of the four mills that are in course of construction in Silverton district are about to begin operations. ——The Green Mountain mill is ready; also the Great Mogul. They will be shortly followed by the Old Hundred mill, and later by Mr. Kinney's 500-ton Gold Prince mill. The snow has not lately retarded operations, and with good weather work will go on, both above and below the surface. The trails are open and the roads and railways are running on schedule time. The installation of six mills with capacities from 200 to 500 tons per day, will add largely to the year's output. The inadequate shipping facilities make it impossible to transport ores in crude state, and concentration is the sole solution of the problem at present. Millions of dollars' worth of ore is stoped in the various mines of the district ready for reduction.

Summit County.

At Frisco the Admiral Co. has 15 claims. Their air-compressor is run by water power. They have a crosscut tunnel in 1,100 ft. and have three well-defined veins, one of them 20 ft. wide. The entire vein is fair grade ore.——The Excelsior has 500 acres of patented land, an electric plant run by water, a 100-ton mill, several thousand feet of development on a vein from three to six feet wide. Their ore runs from $10 to $100 a ton, principally gold.——The King Solomon Tunnel & Development Co. started many years ago the first crosscut tunnel in the Ten Mile range. They were were the first locations made on Royal mountain. Some of these veins are 20 ft. wide. Three years ago this company was organized to complete this tunnel and for the development of this property, together with the Bonaventure and Buena Vista, the Red Bird and Buffalo placers. The company acquired the only available water power on the Ten Mile river. This ground was patented more than 20 years ago as the Flora placer. East of this the King Solomon owns the Wisconsin placer, a mile of the river bed. This property is equipped with a first-class plant, their compressor now being driven by steam. Ten Mile, at its lowest stage, will generate several thousand horse power. It now costs these companies over $200 per annum per horse power if they use either wood or coal. February 16th the King Solomon was in 650 ft. and advancing at the rate of 100 to 150 ft. per month. They have already cut three paying veins of gold and silver ore.

Teller County.

A rich haul of high-grade ore was made at Victor one day last week by H. C. Brown, of the Mine Owners' Association, two barrels full of ore, some of it extremely rich, being corralled. Brown went to Victor with a spring wagon and secured the ore from the assay shop of George Flochinger, in the basement of the Victor *Times* building. The stuff was found in barrels and sacks and was loaded onto the wagon and taken to Cripple Creek. All efforts to locate the proprietor of the shop failed, and it is believed he received a tip that the officers were after him.

The Ajax Consolidated claim, a fraction belonging to the Ajax company and under lease to Colburn & Prentiss, reports a strike of two feet of two-ounce ore at a depth of 350 ft. A steel gallows-frame has been erected and various other improvements are contemplated at the property.

Because the mill and smelter trust shows an inclination to increase rather than reduce the charges for treating Cripple Creek ore, directors of the Findley mine have decided to partly close down until such time as other arrangements can be made or a mill built by the company. The No. 2 (Shurtloff) shaft will be closed and the No. 1 (Findley) will operate a day shift only. Only such ore as is mined in development and cannot be stored under ground will be shipped. Net proceeds from production at the No. 1 shaft during 1905 were $289,031.58, and from the No. 2 shaft $166,338.98, a total of $455,370.56. The cash surplus Jan. 1, 1906, was $201,015.57. President Carlton says: The condition of the mine is good. The Findley has 70,000 tons of broken ore in the stopes. There is also more ore developed than can be broken in the ensuing year as well as known orebodies upon which development is being conducted.

IDAHO.

(Special Correspondence.)—Robert N. Bell, State Inspector of Mines of Idaho, has completed his annual report and issued it in book form. He estimates the mineral output of the State for 1905 at $19,876,409.89, a large increase over that of the year previous. He recommends an enactment of State and Federal law to give the prospector the right to discover and acquire mining property within the territories owned by corporations, through scrip filings, and in all forest reserves. He also favors restricting mineral rights to vertical boundary lines, and says that better protection should be given to the men working in the mines. He reports 6,000 men steadily employed in mining.

Boise, March 3.

Ada County.

It is reported that 800 lbs. of dynamite and dynamite caps were stolen from various powder houses located in the hills northeast of Boise on the 3rd inst. Governor Gooding had a hundred or more guards thrown over the city, and especially around the penitentiary. These guards were placed because almost all of the men whose names have been mentioned in connection with the prosecution of the officers of the Western Federation of Miners had received threatening letters signed 'Kneebone.' Armed men were also placed around the homes of Governor Gooding, Special Prosecutor James Hawley, W. E. Borah and a number of others. In all there are a half dozen powder magazines situated in the hills. The circumstances surrounding the dynamite thefts are being closely guarded.

Boise County.

John McKay formerly foreman of the Banner mines, near Idaho City, died at his home in that place last week.

Custer County.

The Single Gold Standard Mining & Milling Co. is preparing to put in a 5-stamp mill on its claims near Stanley Basin.

The smelter at the White Knob mines at Mackay will be put in operation in a few days. The White Knob property is now being worked on the leasing system.

Idaho County.

R. Cote is planning to instal a plant on his copper property below Whitebird.——The owners of the Crackerjack mine in the Buffalo Hump district, near Grangeville, report an important strike in the lower tunnel.——The Chlorination plant at the Jumbo mine in the Buffalo Hump district has been closed down, having cleaned up all the concentrates.

Kootenai County.

A 12-drill compressor plant will be installed on the Chicago-London group of mines at Paragon gulch, near Cœur d' Alene. Water power will be used in operating the mines.

Shoshone County.

The fire in the upper workings of the Bunker Hill and Sullivan mine at Wardner is reported to be causing considerable trouble again.——Work will be resumed at the Success mine at Wallace during the present week. ——A re-survey of the Bitter Root Mountain Co.'s mine, near Mullan, is being made in order to determine the relative positions of the ledge and the top level crosscut tunnel.——Work has been started on No. 3 crosscut tunnel at the Black Horse mine, near Murray, to tap a ledge 500 ft. below the No. 2 workings. A 12-drill compressor will be installed.——The Pittsburg Co. after having closed down for a couple of weeks, owing to the break-down in the electric machinery, has practically resumed work in both mine and mill and will be working again full force by the end of the week.——Drifting to the west on No. 2 level in the Oom Paul shaft has been discontinued. Work will now be concentrated on the drift to the east.——Manager McDonald of the Idaho-Los Angeles Co. reports having struck a blind ledge at a depth of 75 ft. in the company's mine on Nine Mile creek, near Wallace.

MICHIGAN.

Houghton County.

Allouez has finished cutting the sixth level plat and is starting the levels. The shaft is now 30 ft. below that plat and the plat itself finished. The lode which swung away from the shaft just before the fifth level plat was cut has again been encountered at the sixth level, where it appears to be swinging back into the shaft again. It contains where tapped the richest copper yet found in the Allouez mine.

The Trimountain mill of the Copper Range Co. is planning to instal crushing rolls which will increase the capacity of the mill about 350 tons daily.

MONTANA.

(Special Correspondence).—All the mining properties that for years have been tied up by injunctions in the Amalgamated-Heinze litigation, have now been released, and in a few weeks will be under operation again. The Amalgamated and Butte Coalition interests have agreed on working lines in the formerly disputed ground, and in some instances, where one or the other party to the old disputes owns but a small interest in joint mining claims that interest has been, or will be, transferred to the majority owner, so that there will be no ownership in common between the Amalgamated and the company formed to succeed to the Heinze interests—the Butte Coalition Co. With the settlement of the litigation almost a third will be added to the mining ground of the Amalgamated and Coalition companies, and it is possible to increase the Butte copper output fully 7,000,000 lb. a month, but it is not yet certain that the increase will be made soon. Eighty suits for injunctions and damages, aggregating nearly $100,000,000, were dismissed in the district court a few days ago, and 23 in the United States court. About half a dozen other suits are still pending in the district court between the former warring companies, but they will be dismissed as soon as a few matters can be arranged with some third parties in the suits.

In addition to the large number of deeds from F. A. Heinze to Thomas F. Cole, transferring all the Heinze and United Copper interests in trust for the Butte Coalition Co., which were recorded a week ago, a number of options from Heinze to Cole have been filed with the county recorder at Butte. The options are for interests in the Belmont mine, Colleen Bawn, Canyon, Homestake, Nora, Chief Joseph, and a number of city lots in the Belmont addition. The options assigned now transfer all of Heinze's Butte interests to the new company, with the exception of the Lexington group.

Mr. Heinze denies the report that he will leave the active management of his mining interests in Montana to others, and make his home in New York. He says he will spend most of his time in Montana and will be active in the reconstructive period of Montana mining.

The Butte Central Copper Mining Co. has been incorporated, with a capitalization of $2,500,000, to develop and operate the Ophir mine, southwest of the city. The Ophir was originally a placer location, but years ago was worked for silver and produced quite a revenue, but in recent years it has not paid operating expenses, although various companies and individuals tried it. S. A. Hall, of Butte, organized the new company, and there are associated with him L. M. Strong and Morgan Strong, of Amsterdam, N. Y. The Ophir was owned by G. E. Blackburn, of Butte, from whom it was purchased by the new company for $250,000. The same men have also incorporated the Butte Green Copper Mining Co. to work a small mine, made up of city lots in the eastern portion of the city. The latter company is capitalized for $500,000.

The Butte & London Co. is making rapid progress in sinking its shaft on the Greendale, being down 100 ft. A lot of machinery for a hoisting plant has arrived.

East of the Butte & London, the Butte Exploration Co. is developing the Six O'Clock group, upon which there is a shaft 300 ft. deep. The old shaft is being unwatered for further sinking. The Butte Exploration has strong financial backing from Boston capitalists, and is in position to thoroughly explore the ground.

As an indication of the activity in mining development and the search for new copper deposits in the Butte district, is the fact that in February 100 new locations were made in the district.

Options are being taken in behalf of the West Butte Mining Co. by Carrol Dolman, who, among other claims, has the Columbia and Merrimac.

Half a dozen new companies are developing properties in the East Butte section, south and east of the Pittsburg & Montana Co.'s properties. The Lewishons, of New York, are interested in the Amazon group, and are doing a lot of exploration work.

The Raven Mining Co. has cut a body of ore in the discovery vein of the Snoozer mine, the body opened being a five-foot streak in a vein 42 ft. in width. The ore averages 7% copper. There are three veins in the Snoozer ground, but the company has been doing most of its work on the most northerly vein, upon which 1000 ft. of drifting has been done on the 1,200 ft. level. From the eastern end of the drift a crosscut has been run south to the discovery vein where the richest ore in the mine has been found. Drifting has been begun on that vein and has proceeded 50 ft. in each direction. Eastward the orebody is widening. The same vein has been cut in the crosscut on the 1,500 ft. level and drifting has commenced on it there.

The East Butte Mining Co.'s leasers are shipping 100 tons of first-class ore daily and the company's concentrator is working 100 tons of second class. The company receives a royalty of 25% which pays for all the extensive improvements being made and leaves a good balance monthly for the treasury. Manager Wall says the three-compartment shaft of the Dutton mine will be completed within six months when that mine will begin shipping ore again and the output of the company will be at least 500 tons a day.

Butte, March 4.

Broadwater County.

Two separate 300-ft. shafts are being put down simultaneously on the General Custer and Myantha leads by the Custer Consolidated Mining Co. of Winston.

Park County.

The 50-ton water-jacket smelter at the Great Republic mines, near Cooke City, is being overhauled and repaired.

Silver Bow County.

Disregarding warnings and declaring he would take a chance, forcing his way on the cage already filled with men at the 1,100-ft. station of the Diamond mine at Butte, James Finley was knocked off the cage before it could be stopped and killed on the 5th inst.

NEVADA.

Churchill County.

J. H. Wilson and others are preparing to put in a hoisting plant and other machinery on their claim near Hazen.

Esmeralda County.

The owners of the Blair property, at Silver Peak, are planning to put in a 100-stamp mill and cyanide plant, either at the mine or at its water supply, which is four miles distant and 1,000 ft. lower than the mine.

Ten leases have been let on the Reno claim at Palmetto near Candelaria.——The Manhattan Red Top Co. is preparing to construct a ditch and pipe-line 14 miles long to furnish water and power for its mines at Manhattan.——James Powell of Salt Lake, it is reported, will erect a stamp mill at Manhattan.——It is definitely announced that Chas. M. Schwab and associates will erect an 80-stamp mill on the Montgomery-Shoshone property at Manhattan.

Humboldt County.

New machinery is now being installed on the Nickel mine near Lovelock.

The Cactus Peak Mining & Milling Co., of which E. Bailey is the executive officer and L. W. Bond, of St. Ives, is vice-president and director, has been developing properties in this section for some time. Mr. Bond says the average value of the sacked ore, which is being shipped, is $100 per ton. The quartz is a solid blue or blackish color, heavily charged with sulphides, carrying gold and silver.

Therin, Stauts and Crumpacker are finding good rock at their mines, near Stone House.

Lincoln County.

J. McIntyre is preparing to sink a shaft on his claim near Los Vegas.

The shaft at the Bowlder mine, near Searchlight, has reached a depth of 172 ft., from which point the drift will be run to the northeast. A hoist has been installed at the shaft. —— G. A. Lane and others have decided to erect an arastra on the Colorado river, near Las Vegas. ——A. Siebert reports having found a four-foot vein of galena 40 miles northwest of Las Vegas, at the north end of the Spring mountain range. —— The owners of the Pope claim at Fay will crosscut from both the 100-ft. and 200-ft. levels.

A discovery of horn silver is reported at Baily's Springs, about 25 miles from Pioche, ore assaying at the grass roots 427 oz. silver. An average assay for width of seven feet went 567 oz. of silver. J. L. Whipple and C. Whipple, cattlemen, with a four-horse team, February 27, were resting on a hillside at lunch. Looking down the valley for their horses, they noticed croppings and broke off a piece, which showed it to contain horn silver. A stampede to the new find is in progress.

Nye County.

R. W. Rathbone has bought the Realty and White Swan claims at Johnnie and has begun sinking 100-ft. shafts on each. —— A bed of molybdenite, north of Johnnie, has been reported. Development began last week. —— West & Boller are opening the old Lynch claim near Johnnie.——The owners of the Quartzite Extension, near Johnnie, have struck the contact at a depth of 40 ft. —— S. S. Patrick, of Goldfield, has purchased seven claims, near Johnnie, from J. Lake, and will open them.

Superintendent O. K. Reed of the Goldreed Mines Co. at Kawich, reports a strike made on the 50-ft. level, an entirely new development and a rich one. The ore is full of free gold, and Mr. Reed thinks that he has the main ore-shoot from which rich ore was secured at the surface. The strike was made in a drift at the 50-ft. level. The shaft is down 200 feet.

J. J. Rutledge, acting for an English syndicate, has purchased the Stand Point claims east of Beatty. He has also bonded other claims in the vicinity of Beatty.

Storey County.

The Butters Co., of Virginia City, is planning to put in a 50-stamp mill on Mill street, with crushing capacity of 200 tons. The pulp from the mill will be flumed to the Butters reduction plant.

The quartz discovered in the Ophir–Brunswick tunnel, near Virginia City, is being explored by a west drift skirting the vein.

NEW MEXICO.

Grant County.

Work will be resumed on shaft No. 1 at the Bonney mine, near Lordsburg. This shaft has been idle since the flood of last fall, which caused it to cave in. Re-timbering is now under way.

The people interested in the mines at Pyramid, near Lordsburg, contemplate building a narrow-gauge railroad from the mine to Lordsburg.——H. R. Fry reports having located a silver-lead mine near the Victoria mines, south of Gage.

Lincoln County.

The Old Abe mine, at White Oaks, which was closed on account of the heavy snows, has been re-opened. A drift is being run along the vein to determine the value of about 1,000 ft. of ground, heretofore unexplored.—— The mill on the South Homestead mine, at White Oaks, is to resume operations.——W. A. McIvers has sold his interests at Jicarilla to the Wisconsin Mining Co. The company has an Elspass plant of 50 tons capacity, which will be put in operation.

Otero County.

The Electric Mining & Milling Co. will instal a large plant at its placer mines, at Jarilla, during the next four months.

Rio Arriba County.

A mill is being erected on the Tampa mine, in the Bromide district, near Tierra Amarilla.

Santa Fe County.

The new mill of the Keystone Co., at Golden, is to be put in operation about April 1.

Socorro County.

The mill on the Enterprise mine, near Mogollon, will begin operations in April.

Taos County.

The American Consolidated Mining Co. is running a tunnel in Long Fork canyon, near Taos, to tap a body of ore.——The Crystobal Copper Mining Co. is uncovering a body of copper ore in its tunnel at a depth of 100 ft. on its property, near Taos.

OREGON.

Baker County.

C. C. Cox, of Baker City, has bought out the other owners of the Oklahoma and Red Bell quartz mine in Goose Creek district, 25 miles east of Baker City.

For the first time in six years, Magnolia's ten stamps, near Sumter, are dropping on ores from the Ajax and Snow Bird veins, principally the latter. In the Snow Bird, after eight years' labor, in September last a strike was made in a shaft 30 feet deep. The ores were treated in neighboring mills, netting from $11 to $20 per ton after mining, milling and transportation charges were deducted. A crosscut tunnel was driven to get beneath the ore-shoot at an added depth of 100 feet. Failing to find the orebody, the crosscut was continued and discovered a 12-ft. vein of good ore.

Douglas County.

The owners of the Levens Ledge mine, near Canyonville, have begun driving a tunnel.

The Crystal Consolidated Mining Co. will resume operations at Bohemia.——The stockholders of the Sterling Mining Co. have decided to put in another 10-stamp mill at its mine, near Roseburg.

Jackson County.

A 60-h.p. gasoline air compressor and power drills have been installed at the Blue Ledge copper mines at Applegate, and a series of new tunnels has been begun to cut the deposit at a lower level. The new owners have filed claims on 8,500 in. of water.

Josephine County.

The Golden Drift Mining Co. has temporarily shut down its mine near Grants Pass. Machinery has been ordered for a new steam dredge and for two 400-h.p. turbines. The latter will be installed immediately and another complete unit pump will be added early in the summer.——Electric power has been attached to the Granite Hill 20-stamp mill and hoisting plant at Granite Hill.——The mine of the Michigan Mining & Milling Co. at Murphy will be started up soon.——A. C. Hoefer, manager of the Mount Pitt Hydraulic-Quartz Mining & Milling Co., has purchased air-compressor drills and a stamp mill in San Francisco for the company's mine near Merlin.

Lane County.

The Treasure mine at Blue River has closed down and will not be re-opened until spring.

Union County.

The Oregon Copper Mining & Power Co. is preparing to develop 12 claims six miles from North Powder.

TEXAS.

El Paso County.

Three new roasters are being installed at the smelter of the American Smelting & Refining Co. at El Paso to replace 12 reverberatory furnaces hitherto employed.

UTAH.

Grand County.

The Crescent Peak Gold Mining Co. has let a contract for the sinking of a shaft at Crescent. It is planned to search the lowest level ever attained in that district.

Juab County.

The shaft of the Tetro mine, near Eureka, which has reached a depth of 300 ft., will be continued to the 500-ft. level before crosscutting is undertaken.——Nearly all of the machinery of the Godiva mill at Eureka is in place, except the electric motor. The mill will be started about March 15.——Superintendent E. Levin, of the McKinley mine at Eureka, reports that the tunnel is in 900 ft. and that a crosscut running east has been begun.

C. E. Johnson has begun sinking a shaft on his claim in the Clifton district, 40 miles northwest of Fish Springs in this county. It is reported that galena has been found at a depth of 100 feet.

The re-timbering of 350 ft. of the shaft between the 300 and 700-ft. levels at the Grand Central mine has been completed and the usual force put to work. Preparations are being made to sink the main working shaft several hundred feet, but this will not interfere with taking out ore. A donkey-engine will be installed on the 1,300-ft. level and used in sinking the shaft.

Piute County.

The Revenue Deep Tunnel & Mining Co. has let a contract for the extension of a tunnel on the Copper Belt ground on the company's property, near Marysvale.—— The owners of the Bully Boy property in Bullion canyon, near Marysvale, have been crosscutting to the west in order to find the vein.

Tooele County.

Peter Haack, of Los Angeles, Cal., is reported to have purchased the interests of Willard F. Snyder in the Honerine Mining Co. at Stockton for $314,000.

WASHINGTON.

Ferry County.

The owners of the Pearl mine, near Republic, are putting in a tramway.——A long tunnel at the Oversight mine, near Republic, is being continued. The ledge has not yet been crosscut, and it is given out that shipping will not begin until about May 1.

Okanogan County.

(Special Correspondence.)—F. M. Dallam says there is more development in Okanogan county at present than for years, and the prospect for the country is better than ever before. The Victoria, Vancouver & Eastern Railroad is building into the mines.

The Copper World Extension on the summit of Palmer mountain is sinking a 500-ft. shaft. At a depth of 200 ft. they ran a crosscut and found 40 ft. of high-grade copper ore. The new railroad will run within 10 miles of this property. This is the most important strike made this winter. The Grand View on Mt. Chapaca, in the same district, is nearer the railroad. It is a gold mine. The company has completed a 20-stamp mill and wire tram from mine to mill. One span of this tram is 1200 ft. The company has an electric plant which furnishes power for all purposes.—— The Ruby, which is a high-grade silver proposition, made a recent strike in the 900-ft. tunnel.——During the winter the Q. S., a copper mine situated between the Loomis and Conconully, has struck the ledge at a distance of 1,200 ft. in the tunnel.

Spokane, March 3.

The Riblet Tramway Co., of St. Louis, has completed a 4,300 ft. aerial tramway for the Grand View Gold Mining Co., extending from the company's mine to its 20-stamp mill on Palmer Lake, near Loomis.

The 750-h. p. electric plant at the Palmer mountain tunnel, near Loomis, is practically completed, reports John Boyd, manager of the company. It cost $51,000. The turbine wheel operates under a head of 370 ft. The water is taken from Toat's Coulee creek through a 4 by 2-ft. flume 5,400 ft. long.

FOREIGN.

BRITISH COLUMBIA.

Burrard District.

The Rosella Mining & Development Co. has completed its plant at Telegraph creek and will commence operations about June 1.——The Prospecting, Mining & Development Co., of Seattle, has secured dredging rights at Telegraph creek, and is now putting a dredge at China bar.

Comox-Atlin District.

Dr. Young, member of the British Columbia parliament for Atlin, has introduced a bill to amend the placer mining act so that claim owners may acquire claims 500 ft. long along the creeks and 500 ft. on either side to the hillsides.

G.W. Elliott, representing Seattle and Chicago people, has made final payment on the Bonanza group of galena claims at Bowen island. This group includes eight claims on the west slope of Bowen island, running down to tidewater.——E. B. MacFarlane and others of Portland, Or., are preparing to begin development work on the Stewart claims, near Port Simpson. A steam or electric tram will be put in.

Lardeau District.

The owners of the Del Rey mine, at Camborne, are opening a vein of free gold quartz in the west drift. The various smelters in the Kootenay district have made a reduction of 20% in charges for the treatment of lead ores.

Victoria District.

An English syndicate has purchased five mineral claims near Parson's bridge, formerly owned by J. Berryman of the Excelsior Hotel, Victoria. A diamond-drill, costing in the neighborhood of $4,000, will be installed.

Yale and Cariboo District.

The steel hoods from the furnaces at the Granby smelter at Grand Forks, are being replaced by brick. A new 10-inch steel pipe is being laid from the pump-house to the furnaces and two tramways are being laid in the furnace and converter building.——New machinery will be installed at the Sullivan smelter at Marysville.——R. P. Inglis, of Montreal, has bought the Golden Sovereign claims at Aspen Grove from McConnell & Millar.

The owners of the Helen mine at Greenwood have purchased the Strathmore mine, in the same section.—— The Granby smelter, near Phœnix, reports having made a record-breaking run of 2,850 tons of ore one day last week.——About 500 ft. of diamond-drill work has been done on the Betts & Hesperus group of mines, near Phœnix.——Excavating for extensive enlargements at the British Columbia Copper Co.'s smelter at Greenwood has been started.

MEXICO.

Official notice has been sent out by the Mexican Secretary of State that President Diaz had revoked the recent order forbidding foreigners to locate mines in the State of Sonora, Mex., and in Lower California.

A mining convention will be held in Mexico City on May 1 for the purpose of establishing a permanent chamber of mines at Mexico.

Chihuahua.

The Monteverde Mining Co. has secured water rights in the Monteverde river, near Chihuahua.

Work has been resumed on the Culbera mine, near Etzatlan. A tunnel will be driven toward the vein.

Durango.

Large reduction works will be installed in the Guadalajara mine at Inde. The plant will include a 100-ton wet crushing cyanide plant electrically driven.

Guanajuato.

Ernest du Bois, manager of the Mexico Gold & Silver Recovery Co., has taken legal action to close the experimental cyanide plant of the Guanajuato Reduction & Mines Co., at Bustos, claiming that the latter company is using MacArthur-Forrest cyanide process without authorization.

Hermosillo.

The San Rafael Copper Mining Co. is to begin development on its holdings, 16 miles from Hermosillo.

Sonora.

The Alamos Mining Co. is to erect a smelter on its property in the Alamos district, below Guaymas.——A leaching plant is to be put in at the Roy mine in the Alamos district.——O. T. Clark, of the Silver Leaf Mining & Milling Co., states that extensive development will begin on the company's property, near Nacozari.

Personal.

EDGAR RICKARD is in New York.

CHARLES BUTTERS is at Copala, Mexico.

C. W. PURINGTON is at Phœnix, Arizona.

JOHN HAYS HAMMOND is at Salt Lake City.

WALTER P. JENNEY is at Tonopah, Nevada.

JAMES W. NEILL is on his way to New York.

E. E. EDMONDS, of Goldfield, is in San Francisco.

MARK L. REQUA has returned from Ely, Nevada.

DANIEL GUGGENHEIM is expected in San Francisco.

J. D. HARDIN has returned to Deadwood from the East.

J. A. SHINN has returned to Leadville from New York.

BEN. B. LAWRENCE has returned to New York from Cuba.

GERALD M. BROWNE is at Kalgoorlie, Western Australia.

RICHARD PEARCE is on his way from Denver to England.

HOMER WILSON has returned to San Francisco from New York.

CHARLES MCHUGH has returned to Deadwood from New York.

THOS. H. LEGGETT is on his way to London, by way of New York.

JOHN Y. COLE, formerly at Rossland, is now at Cobalt, Ontario.

THOS. H. MEANS, of the Reclamation Service, is at the St. Francis.

F. H. MINARD is in Arizona. He expects to go to London shortly.

J. F. HALLORAN has returned to San Francisco, after a holiday in Tahiti.

FRANK ENSENSPERGER is manager of the Union Hill mine, near Grass Valley.

ROBERT GRAHAM has returned to his mines at Huepec, Mexico, from the East.

W. H. TREWARTHA-JAMES is engaged in advisory work in Western Australia.

L. C. CHURCH is visiting San Francisco and returns this week to Joplin, Missouri.

A. O. CAUTLEY, of London, has been negotiating for mines at Guanajuato, Mexico.

M. B. SPAULDING is general manager of the Real del Monte mines, at Pachuca, Mexico.

R. E. TAYLOR, of Tonopah, and J. N. PEYTON, of Spokane, are at the Palace Hotel.

H. KILBURN SCOTT, who has been in Brazil reporting on mining properties, is in London.

PHILIP L. FOSTER visited San Francisco on his return from El Oro, Mexico, to New York.

PERCY B. MCCOY, of Kempton & McCoy, has returned to New York from Nicaragua.

A. CHESTER BEATTY is examining the Nevada Consolidated copper mines, at Ely, Nevada.

FREDERICK H. HATCH is now with Lewis & Marks, at 28 Bishopsgate Street (Within), London.

A. STEWART MAY has returned from Mexico, and has opened an office at 82 Wall St., New York.

EDGAR NEWHOUSE has been appointed managing director of the new Balaklala Co., near Kennett.

JOHN BOYD, manager of the Palmer Mountain Tunnel Co., near Loomis, Wash., has gone to New York.

JAS. W. MALCOLMSON, soon after his return from Oaxaca, has left El Paso to go to Guanajuato, Mexico.

C. HOWARD, of San Francisco, has been making an examination of the Lecompton mine, near Nevada City.

JUAN F. BRANDES of Denver is on his way to Chihuahua, Mexico. He is expected in San Francisco within a month.

W. E. SHARP of Florence, Ariz., is in San Francisco to purchase machinery for his mining interest, near Florence.

H. L. PAYNE, of the Wade & Wade Co., is in southeastern California examining gold mines for local capitalists.

JOHN GRAY has returned from California to the general management of the Wasp No. 2 mine, near Lead City, South Dakota.

GEORGE A. TWEEDY has returned to Los Angeles from Mazatlan, Mexico, where he is consulting engineer to the Minas del Tajo.

OSCAR ROHN, formerly of Michigan, has taken the management of the property of the Pittsburg & Montana Copper Co. at Butte.

L. W. FELT of Lake City has succeeded E. W. Walters as manager of the Green Mountain Mining & Milling Co. at Silverton, Colo.

R. B. NICKERSON, lately superintendent of the Confidence mine, in Tuolumne county, has taken up residence at Berkeley, California.

JOHN C. BRENNON, manager of the Ajuchitlan Mining Co., in Queretaro, has joined in partnership with ALVIN B. CARPENTER, at Mexico City.

Latest Market Reports.

SAN FRANCISCO, March 8, 1906.

ANGLO-AMERICAN SHARES.

London, March 8, 1906.

	£	s	d		£	s	d
Camp Bird	1	8	0	Oroville Dredging	0	19	4½
El Oro	1	5	7½	Stratton's Independence	0	7	3
Esperanza	4	6	3	Tomboy	1	7	6
Dolores	1	17	6				

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. March 8, 1906.)

Amalgamated	$104⅞	North Butte	$ 81½
Anaconda	265	Old Dominion	45¾
Bingham Copper	39¼	Shannon	6¾
Calumet & Hecla	685	Tennessee Copper	43
Daly West	15⅛	Tonopah-Nevada	18
Granby	12¼	United Copper	64
Greene Consolidated	27⅛	United States	54¾
Nevada Con. Copper	17	Utah Copper	31½

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 20	Ophir	$5 25
Hale & Norcross	1 00	Potosi	0 10
Mexican	1 20	Savage	0 41
Exchequer	0 51	Yellow Jacket	0 08

[Tonopah and Goldfield.]

Belmont	$5 12½	Montana-Tonopah	$2 90
Golden Anchor	1 30	Ohio-Tonopah	0 47
Jim Butler	1 60	Red Top	1 92½
Jumbo	1 50	Sandstorm	1 45
Kendall	0 83	Tonopah Ex	11 00
Midway	2 17½	West End	2 65

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 64½c. per fine ounce; San Francisco, 64½c.; London, 29⅝d. (standard ounce, 925 fine); Mexican dollars, 51@52c., San Francisco; 49½c., New York.

COPPER.—New York (by wire, average for week ending March 8), Lake, $18.50@18.62; Electrolytic, 18.20@18.37c.; Casting, 17.87@18.12c. per pound. Mill copper plates, $21; bars, 21@24c. London: £79 15s. spot per ton.

LEAD.—New York (by wire, average for week ending March 8), $5.35 per 100 lb; San Francisco, pig, 5.70@6.60c. per lb.; pipe 8@8½c.; sheet, 9@9½c.; London: £15 10s. ℔ long ton.

SPELTER.—New York (by wire, average for week ending March 8), $6.15@6.25 ℔ 100 lb.; London, £24 7s. 6d. ℔ ton; San Francisco, ton lots, 7c.; 100-lb lots, 7¼c.

TIN.—New York, pig, $35.62½@35.97½; bar tin, ℔ lb., 42½c.; pig, 39c. London, £163 2s. 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, nominal, $20@25 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$41.50, large lots; London, £7 7s 6d.; San Francisco, local, $39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 35@38c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 16c@17c; San Francisco, 1000-lb. lots, 16c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8¾c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11¼@11½c; 14 oz., 10@10½c; 12 oz., 9¼@9½c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9¼@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6¼@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

COAL.—San Francisco, coast, yard prices to dealers: Wellington, $7.50; Seattle, $6.50; Coos Bay, $5.50; Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $14.00; Cannel, $8.50; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

Trade Treatises.

Allis-Chalmers Co. have issued Catalogue No. 129, descriptive of machinery for cement making.

Commercial Paragraphs.

THE Champion Copper Co., of Houghton, Mich., recently purchased a standard 20-ft. Hancock jig from the Allis-Chalmers Co., Milwaukee.

THE Alaska Treadwell Gold Mining Co., of Treadwell, Alaska, has ordered a 20x48-in. double-drum, direct-acting hoisting engine, built by the Allis-Chalmers Co., Milwaukee.

THE assay firm of Wade & Wade, who have been for over 18 years in business in Los Angeles, have recently re-organized and have taken in as a partner H. L. Payne, formerly of Cleveland, O. Mr. Payne will devote his time to mine reporting and to general chemical work.

THE Colorado Iron Works Co. of Denver, Colo., lately shipped two impact screens to the Annie Laurie mill at Kimberly, Utah, and one to the Compania mine, Chihuahua, Mexico; two forehearths and two vertical-shaft skips to the St. Joe Lead Co., Bonne Terre, Mo., and two sample grinders to the Nevada-Goldfield Reduction Co., Goldfield, Nevada.

Messrs. Harron, Rickard & McCone report the sale of a large cross-compound, two-stage, condensing Corliss compressor, of the Ingersoll-Rand make, to the United Verde mine, at Jerome, Arizona. The machine is of special interest on account of its size. It has steam cylinders 28 and 52 in. diam., air cylinders 44½ and 26½ in. diam., all 48-in. stroke. At 75 r.p.m. the piston displacement is 6,060 cu. ft. free air per minute; the compressor complete weighs about 300,000 lb. The machine is to operate at 5,500 ft. altitude and develops about 940 h.p. The air pressure is to be 100 pounds.

THE Power & Mining Machinery Co., of Cudahy, Wisconsin, has closed a contract for a complete rock crushing plant to be erected for the Little Falls Stone Co., Little Falls, New York. The main crusher is a No. 10 McCully, the largest machine of its kind ever designed or built. Its weight will be nearly 200,000 lb., and its capacity, under favorable conditions, 700 tons of crushed stone per hour. Among the principal auxiliary machinery to be installed in this plant are four No. 6 McCully crushers for crushing rejections from the No. 10 crusher; one No. 10 elevator 60 ft. long; one No. 9 elevator 67 ft. long; two 60 in. by 15 ft. rejection screens, and two 60 in. by 35 ft. sizing screens of special design. The product from this plant will be used for ballast, railroad and concrete work. All of the dust or fine material from the crushing is to be used for making cement bricks, the manufacture of which will be carried on in a near-by plant owned and operated by the same company. H. A. Shaper, formerly manager of the Mohawk Valley Stone Co., is the general manager of this new enterprise.

THE American Institute of Mining Engineers, which for the two days preceding had been in annual session at Bethlehem, Pa., was on February 24 entertained by the Ingersoll-Rand Co. at their works at Phillipsburg, N. J. A special train brought the visitors—165 in number—direct to the grounds; they were received by President W. L. Saunders of the company, assisted by members of the sales and engineering departments. The party was at once photographed on the steps of the office building, and each guest was presented with a leaflet, showing a plan of the works, in black, with the route of the visitors through the shops, in red. In addition, the leaflet contained tabulated engineering data of the shop arrangement, equipment and capacity, together with a record of the company's machine production since its foundation in 1871. The guests, divided into parties, were piloted over the specified route through the shops, inspecting the many classes of machinery built there, both in construction and in operation. After a morning spent in this manner, the visitors were conducted to the dining-room on the third floor of the office building, where a luncheon was served. After an hour of fellowship and good cheer, a second photograph was taken and the company was called to order by Mr. De Saules, acting chairman of the entertainment committee. After a few happy remarks, the chairman called upon President Saunders of the Ingersoll-Rand Co., who responded, calling attention, among other things, to the fact that the Institute was not up-to-date, in that it still clung to the hand-hammers on its emblematic seal, which should properly be replaced by a machine-drill as more typical of modern engineering progress. Mr. Jasper Rand, vice-president of the company, then made a few remarks upon the close and intimate relations in the new company which had taken the place of the keen rivalry between the former Ingersoll and Rand companies. The next speaker was Mr. Edmund C. Pechin, one of the charter members of the Institute, who gave some historical reminiscences. He was followed by Dr. R. W. Raymond, secretary of the Institute. The informal program closed with a song by Prof. Franklin of Lehigh University, which told of the intimate relations of 'Sandy and his mule' in the days before machinery was introduced in the coal mine. The party then adjourned, returning by their special train.

Obituary.

M. J. FERGUSON, mining engineer, was instantly killed on the 4th inst., while surveying in the Yampa mine at Bingham, Utah.

FRANK CAREY, a mine operator of Copper river and Nome, Alaska, recently jumped from the steamer *Excelsior* near Yakutat, and was drowned.

JUDGE C. V. GOTTSCHALK, of San Andreas, Cal., died by his own hand on Friday the 2d inst. For years he had been a prominent figure in the California bar and had been identified with many important mining suits. He was respected by all parties to these suits because of his clearheadedness and eminent fairness in deciding difficult points at law. He was 79 years of age and in recent years had become enfeebled, and had almost lost his eyesight.

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SAN FRANCISCO, MARCH 17, 1906.

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EDITORIAL.

PRESIDENT DIAZ has revoked the recent order forbidding foreigners to locate mining claims in the State of Sonora and in Lower California. It was an order which brought discredit to the Mexican Government and we are glad to announce its revocation.

THE final report covering the liquidation of the Whitaker Wright companies, at London, exhibits a tremendous loss to the British public. The assets, which were estimated to produce $14,505,100, realized $2,575,970. To realize this, cost over $1,500,000. The unsecured creditors, whose claims aggregated $12,958,375, received $921,585. There was nothing to return to the shareholders. Liquidation is evidently a costly luxury and the results of this particular one will confirm the average eupeptic citizen's notion that liquidation resembles the metallurgical process of liquation.

RUSSIAN bureaucracy is again inviting foreign capital to exploit its territory in Asia. Northern Manchuria is described as a region affording a good field for American enterprise and eastern Siberia is suggested as ready for the American explorer. We trust that no one will be misled by any specious promises from a quarter so untrustworthy. It is easy to invest money in the Czar's dominions, but it is difficult to get it out. A country ruled by an irresponsible bureaucracy is a poor place for mining operations; even a South American republic is better, because it can be called to order.

WHEN Walter Scott, the alleged "cowboy miner of Death Valley," flashed his money all over the continent and hired a special train to beat the record from Los Angeles to Chicago, in order to proceed to New York and spend his swag on the Bowery like a drunken sailor, it was supposed that he might be preparing to sell a mine. People sometimes do funny things when they sell mines. The stories of prospecting in the desert, of a mysterious hole whence came golden treasure, of 'gun play' in the wilds, and the dramatic efforts of other adventurers to find the source of his wealth, seemed likely precursors to a flotation either in Wall street or State street. But the purpose is now disclosed, and it is not without its cynical humor. Scotty has gone on the stage!

Guggenheim Activity.

It is understood that Messrs. J. P. Morgan and Daniel Guggenheim, representing two important reservoirs of money, have entered into a joint agreement to build a railroad about 400 miles long, from Valdez, on the coast of Alaska, to Eagle City, on the Yukon, traversing the Tanana region and tapping the Copper River country, which is considered one of the richest portions of Alaska. They have an option on the Bonanza, Nikolai and Elliott creek mines in the Copper River district and they have arranged to secure the control of Henry Bratnober's interests in other copper claims in the Tanana district. Moreover, the cohorts of the Guggenheims have closed around the Nevada Consolidated copper mines at Ely, Nevada. The control of this enormous deposit of low-grade copper ore has passed to them and they have acquired the Giroux property in the same locality. These deposits were estimated nine months ago to contain six million tons of 2½ per cent copper ore, but recent exploratory work has shown even this unusual tonnage to be only a part of an immense mass of sulphide ore disseminated in rhyolite porphyry. Again, the American Smelters Securities Corporation has quietly secured the Balaklala mine in Shasta county and their engineers are making a preliminary investigation of Thomas W. Lawson's Trinity mine. All these purchases and industrial activities foreshadow the growth of an important copper mining and smelting industry on this Coast, of dimensions far exceeding even the present noteworthy operations in the red metal. The output of the copper mines in our own State, in Nevada and in Alaska will be tributary to the new smelter which will be built close to San Francisco, as stated in these columns last week. The extreme western part of North America is going to produce a great deal of copper, and we welcome the increased importance as a technical and industrial center which these events will give to the City by the Golden Gate; nevertheless, we do regret the passing of mines well managed by local men into the hands of the big financiers who are objectionable only because of the tendency they exhibit to form big consolidations hurtful to legitimate competition and calculated to stifle the individuality of professional men.

CONTRIBUTIONS to the discussion on 'The Best Shape for a Shaft' continue to arrive, and it is evident that the subject is one of practical interest. Mr. Thomas H. Leggett is an authority, having been engineer to some of the big undertakings on the Rand, while Mr. Robert Peele, professor of mining in the Columbia School of Mines, has a close acquaintance with Western mining such as gives his views particular value. Mr. Theodore E. Schwarz has had charge of some of the largest mines in Colorado. Next week we shall publish contributions on this subject from Messrs. John A. Church, R. V. Norris and other experienced engineers.

THE coal-mine disaster in the Pas de Calais region, in northern France, is of unusual magnitude, for the loss amounts to 1,212 lives. This catastrophe is imputed to the coal-miner's great enemy, fire damp, the explosion at Courrieres having been followed by such destruction to the mine-openings as to render the work of rescue impossible. We are able to publish a timely article by Mr. Donald F. Campbell, who visited the locality recently. The photographs suggest the conditions under which the miners work. It remains but to direct attention to the one compensating feature of the calamity, and that is the heroic assistance given by Germans, from the Westphalian coalfield, who came to the aid of the French officials at Courrieres.

AT BISBEE, the mine and smelter workmen met on March 5 to decide whether they should form a union to co-operate with the Western Federation of Miners, and it is worthy of record that when the poll was taken, there were 2,228 ballots against and 428 for the proposal. The vote is stated to represent the full force of the local organization. While the matter may not be finally settled, the vote is significant. There are many mining corporations that might well take a hint from the experience of the Copper Queen and Calumet & Arizona companies and model the treatment of their employees accordingly. The fact is generally appreciated at Bisbee that nothing except the upright dealings of the officials controlling the operations of these companies is responsible for the attitude of local labor to the outside union. "Man's inhumanity to man" is at the bottom of half the labor disturbances, and there is no way better calculated to secure efficient work and undisturbed continuity of operations than methods based on fair dealing and humane consideration, on both sides

Events in Idaho.

Boise City, the capital of Idaho, is the scene of important events at this time, for the preliminary proceedings leading from the arrest of a number of well-known agitators is attracting the attention of mining communities throughout the country. The idea prevails among laboring men and, more particularly, the members of various labor unions, that the men now held in the county jail at Caldwell are being hounded by the agents of mine-owners and others keenly desirous of stamping out the Western Federation of Miners. For this reason the Governor of Idaho is receiving letters of protest frem all over the country, and at the same time the labor organizations are contributing generously toward the expense of retaining able counsel for the defense. However, it is also a fact that those who, as owners of mines, managers and engineers, have suffered from the tyranny of the worst form of trades-unionism during the stormy days when the Cœur d'Alene, Cripple Creek and Telluride were synonyms for brutalities disgraceful to any civilized government, are fearful that the men arrested for the murder of ex-Governor Steunenberg and other assassinations will not be successfully prosecuted because so much pressure, political and financial, is being brought to bear upon the local authorities at Boise. We have received letters from individuals taking an interest in both sides of the case, and expressing the contrary opinions just outlined.

Our position as spokesman for the serious mining men, not capitalists alone nor workmen alone, but all who, whether by brains, muscle or money, work toward the development of the mineral resources of these United States first, and of other countries afterward—the position we take is, that justice must

be done and the Law, too long outraged, must be vindicated, not in the spirit of a capitalist vendetta against labor or labor's feud against capital, but in justification of popular government and as the assertion of the community to be free from the tyranny of any lawless organization, led by no matter whom, whether mine-owner or mine-worker. It is against the best interests of those who are interested in mines, whether as investors or managers, to take any action that will lead to the conviction of an innocent man, and it is equally hurtful to the good intent of trades-unionism to defend a criminal. Therefore it is fortunate that at this time the Governor of Idaho, Frank R. Gooding, should have spoken so clearly as to his position in the matter. It was in response to a letter from a committee of the Central Labor Union of Evansville, Indiana, which expressed regret at the idea that "prosecution of the men is in pursuance of a conspiracy" among mine operators to destroy the Western Federation of Miners. The Governor explained that their arrest was based on the voluntary confession of two suspects who had given information, so precise and so revolting, that he, the Governor, was compelled by his oath of office and by his feelings as a man and an executive to ask for the arrest and extradition (from the State of Colorado) of the men implicated. He concludes his letter to the committee at Evansville in these words: "If the stories are true, you and the members of your union will certainly agree with me that no punishment under the law is too severe to be meted out to the guilty men. Their guilt or their innocence cannot be said to have any bearing upon the rights or privileges of union labor. Labor organizations are vitally interested in this case. If the men now accused are guilty of murder, they should be condemned by all labor organizations in the world. If they are innocent the State of Idaho will do its duty in righting the wrong done them." These are manly words and they betoken a man who is safe and sane. It is fortunate that the direction of the prosecution is largely in the hands of so good a citizen.

Counterfeit Processes.

The vendor of patent medicines never applies to the reputable physician. He may be a charlatan, but at least he has sense. And by the same token, the man with a fake process never takes his wares to the intelligent mining engineer or metallurgist. His chosen field is the raw, young camp where lucky prospectors and promoters have suddenly blossomed out into mine-owners, and are in a ripe condition to be humbugged. Unfortunately, the poor prospector who wakes up and finds himself rich is not always the good friend of science. If not in overt antagonism to the great fund of scientific knowledge which has been accumulating since long before he was born, he may be simply indifferent to it, for neither by training nor environment is he the type of man who studies and investigates. Moreover, though shrewd and common-sensible in most respects, he is imbued with the time-honored fallacy that engineers and other professional men are impractical; and his partners and associates, abetted by the wily man with the 'new process,' advise him to shun the dangerous professional person whom they have ingloriously branded as an *expert!* "No experts for me!" says the prospector-manager; "*I* don't want to make any mistakes." And the man with the new process—be it a patent, revolving hot-air amalgamator, or an electro-thermal cyanide agitator—is at once installed as guide, philosopher and friend!

The prospector-manager is generally sure of his own views, because the 'new process' man so cordially agrees with him in the premises. These premises are: (1) that metallurgists, so-called, are simply floundering in darkness and ignorance; (2) that all known and well-established processes are empirical makeshifts reluctantly adopted by mining companies because they can find nothing better; (3) that professional men must be avoided as so many harpies on the lookout for big fees and easy jobs.

A journal in one of our new camps recently stated, in referring to a recent mill installation, that the process to be used was a secret; that it was something like the cyanide process and yet not quite like it, the distinguishing point of difference being that "no pans or basins were to be used!" Now could anything be more deplorable than the cyanide process bereft of pans and basins?

It is evident that the 'new process' man is abroad in the land. He should be carefully watched, and the mine-manager with a problem of ore-treatment to solve should be able to distinguish between this plausible individual and the intelligent investigator who quietly works along legitimate lines of improvement in applied metallurgy. The man who enriches science with a new and valuable idea, a labor-saving appliance, or any improvement that enhances the efficiency of a known process is pretty sure of hearty and instant recognition. These remarks are manifestly not directed against him, but against that misguided enthusiast, half-promoter, half charlatan, who, with the little knowledge which is so dangerous a thing, and with a sublime impudence and cocksuredness, goes about luring the credulous into an adoption of his untried schemes.

An Important Decision.

In deciding the case of the Grand Central against the Mammoth Mining Company, the Supreme Court of Utah has given us a valuable treatise on the law of mines. Not since Justice Field wrote the decision in the Eureka-Richmond case have we had anything comparable to it, especially in clearness of statement, in fulness and breadth of treatment and in the vigorous way each issue is exhaustively discussed and conclusively decided. It is a decision that will be welcomed by the mining community generally, and that anyone with a fair knowledge of mines can read and understand, so plain and simple is the language. The Grand Central won every point by a masterly defence—cleverly conceived and ably sustained. Best of all, no one, unless blinded by interest, can read this decision and not feel that the rightful owner of the ore won. We publish a lengthy abstract of the decision on another page.

It is the custom to disparage the United States mining law; unfortunately, it has come to stay, and it will be well to realize the fact. Perhaps in time it may be possible to amend the law in certain particulars, but experience demonstrates that every attempt to substitute any other is doomed to failure; without assigning any reason, the general run of people interested in mines have again and again shown that they desire no change in the law, however manifest it may be to careful students of the problem that the law is radically defective. In any event an amended law could only be applied in new mining districts. It is a matter of congratulation that the courts, especially during the last few years, have displayed a steadfast intent to construe and build up the law, by a series of able decisions, which in time will define the rights of the miner under circumstances commonly arising. This constructive policy is illuminated by a number of decisions on apex rights, leading up to the several decrees of the Court of Appeals in the St. Louis-Montana case, and also the late decision in the Stemwinder-Bunker Hill suits, adjudicating interfering extra-lateral rights, and upholding the principle that the position of the 'wall' of a lode is a commercial one; as was also decided in the case under review. The Supreme Court of Utah does not lay bare the imperfections of the mining law, but goes to work to ascertain the facts, to interpret the law, and to determine the rights of the parties thereunder; in short, the Court takes the law as it exists, and, in settling the property rights of the litigants, leaves us with a better and broader understanding of the meaning of the Act of 1872. This decision is pre-eminently constructive; we have had decisions which complicated, without intending to do so, the interpretation of the Act; this one simplifies it. It is certain to be quoted at great length in the judication of many issues arising under the mining law; particularly questions relating to 'discovery' and 'apex,' and to the right to follow a vein on the dip; questions involving the determination of what constitutes a 'vein or lode,' and what are its boundaries. So far-reaching may it prove, in application to legal conflicts constantly arising, that many an attorney, wrestling with knotty problems of this kind, in the widely scattered mining camps of the West, may truly say to the Grand Central, in the words of Rosalind to Orlando, "Sir, you have wrestled well, and overthrown more than your enemies."

By the Way.

The volcanic region of America extends along its great mountain backbone from Patagonia to Alaska. In a recent issue of the *Evening Post*, New York, Mr. F. S. Dillenbaugh makes some interesting observations concerning the volcanic fires of the frozen North. He says:

In Alaska we find one of the greatest centers of present volcanic energy, a belt of country 1,600 miles long by 40 wide, adorned by a series of noble peaks beginning with Mt. Wrangel above the head of Cook Inlet and extending throughout the length of the Peninsula and the Aleutian chain of islands. No less than 25 of these islands possess volcanic activity, and in the whole belt more than 50 volcanic peaks, active, dormant or extinct, are counted.

On a fair summer day, as you gaze at one of these beautiful, tranquil cones, it seems as if they were asleep forever. As the peak of Augustin, for example, rises 3,000 ft. above the encircling sea with its fine, symmetrical cone, it is a joy to behold. So peaceful does it seem that one scouts the suggestion that it could be dangerous or had ever broken the general serenity, yet no longer ago than October 6, 1883, a bright, clear day, at eight o'clock in the morning, a loud report was heard by the settlers at a little place called English Harbor. Dense volumes of smoke immediately were seen to rise from the volcano of Augustin, about 50 miles away, and it was plain that a great catastrophe had occurred. Later inspection revealed a cataclysm. The island peak had been rent asunder, till from one side to the other the sea flowed through its center, and one-half of the mountain had fallen down. A party of natives who had been there after sea otter were never seen again. Thirty feet high, an earthquake wave swept the shores, but fortunately, coming on a low tide, the people at English Harbor were preserved from destruction. The sky grew dark. Thick dust showered over the whole region. Lamps were lighted. At night flames were seen issuing from the summit; at least so the settlers thought, but their flames were probably only the reflection of the molten lava on the issuing steam. The next day, when the peak could be clearly seen once more, it was found to be bare of snow. In the strait between the volcano and the mainland a new island appeared, a mile and a half long and 75 feet high. Other peaks in sympathy ejected dust and steam. Forests of the shores were killed by the rain of hot ashes. Yet only a year before this happened it was not known that Augustin was a volcano. In the August preceding the eruption a film of smoke arose from the peak and revealed its true nature.

Only a few days before this fearful eruption of Augustin, about which we should have heard much had any considerable settlement been in that vicinity, tremendous activity was in progress toward the other end of this long and narrow volcanic area. About 30 miles north of the island of Umnak in 1796 a new volcano had suddenly appeared above the water, and now as a companion to it another larger one arose close at hand. The older one had by this time entirely ceased its activity, but the new one took up the cause, and for years decorated the locality with whirling steam and lurid fires. In 1891 it was still enveloped in steam clouds arising from small fissures and crater-like openings. This steam, charged with dust, is commonly called smoke, but in reality a volcano does not smoke.

Where the subterranean fires in this entire volcanic belt burn most fiercely is on the island of Unimak, whose length and breadth are respectively only 60 and 20 miles. It is a veritable Hades. A very narrow strait separates it from the extreme end of the peninsula of Alaska and a string of small islands leads across to Unalaska, consequently it is not a difficult place to get at, as places go in that part of the world. It is also a richer island, more fertile, and with better food supply than many others of the archipelago, yet it is uninhabited and has been for most of the last century. This is probably to be ascribed to the violence of its subterranean fires, although a diabolical massacre by the Russians is also mentioned as a cause. But the entire area is full of volcanic vents, culminating in the stately peak of Shishaldin, some 9,000 feet high. This superb volcano is in a state of constant mild activity, and on a fair day, with the long trail of smoke from its pointed summit, is one of the most graceful mountains on earth, suggesting Vesuvius, although more than twice as high, and strongly resembling also the famous sacred mountain of Japan, though a more perfect cone than either of these. It also vies with St. Helens in Washington, the most perfect cone on our Pacific coast. From Shishaldin, according to Westdahl of the Coast Survey, active discharges "come in puffs like steam at first, and rising probably 100 ft. or more above the summit, then turn darker in color and stream off horizontally with the direction of the wind." The snow line is about 1,800 ft. above the sea. At about 3,000 ft. below the summit the regular cone begins to spread and the slopes below are far less precipitous, giving the long, graceful outline which, with the sharp peak, renders this volcano strikingly symmetrical.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

NATIVE LEAD is rarely found, though reported from Canada.

WHERE veins unite in depth the senior locator takes all below the union of both veins.

IN drifting it is always advisable to place the bar to which the machine drill is clamped in a horizontal position.

THE depth of a shaft may be approximately measured by means of an anerold barometer, taking the mean of a number of readings.

SEVERAL BULLETINS of the California State Mining Bureau are out of print, among them No. 2, 'Methods of Mine Timbering.'

NOT infrequently a fault plane intersecting a vein may be the direct cause of an enrichment of the vein for some distance above the fault.

THE owner of a water right cannot carry a ditch, pipeline or flume across the land of others without first having obtained a right of way.

THERE is no such mineral as gold radium. Radium is an element, recently discovered. It is usually associated with the various ores of uranium, and is comparatively rare.

BASALTIC and other basic volcanic rocks are not known to contain gold, unless the metal is carried into zones of fracture in such rocks subsequent to their extrusion.

THE 21st annual report of the United States Geological Survey, Part III, gives a comprehensive description of localities in the Black Hills of South Dakota by T. A. Jagger, Jr.

IT is good business to place a skip in a shaft of as large sectional area as practicable, and of no greater depth than is reasonably consistent with the hoisting power available.

ALL first-class concentrating machines have devices for leveling. Where these are not provided the machines may be leveled by driving wedges beneath the frame at the proper place.

ONE cause of disaster in working metal mines by pillar and room method is in leaving pillars in large veins no larger than those which have been found sufficient to support the walls in small veins.

THE small hand pneumatic hammer-drills have been successfully employed in drilling holes in hard rock to a depth of four or five feet, but their greatest economy is found in drilling the first 24 to 30 inches.

SHAFTS SUNK within the limits of a town or close to a public highway should be surrounded by a fence for the safety of passers by. Montana has a State law making it compulsory to provide such protection.

IN mines where electric wires are carried through shafts, drifts, and other main workings, they should be placed where they are not readily reached by workmen, in the ordinary performance of their duties.

IN chemical laboratory work, all quantities are stated in metric terms. A standard solution of potassium cyanide written '44.5 per liter of water,' means that 44.5 grams of the salt have been added to one liter of water.

WIRE ROPE must not be coiled and uncoiled like other rope, but must be wound on a reel or rolled up on itself in a coil, like a wheel rolled along the ground. Coiling and uncoiling wire rope will cause it to kink after a few turns.

THE Civil Code of California thus legally defines hydraulic mining: "Hydraulic mining within the meaning of this title is mining by means of the application of water under pressure through a nozzle against a natural bank."

ONE of the most important functions of receivers of air compressors is to reduce or wholly destroy the pulsations caused by the rapid discharge of air from the cylinder into the pipe-line. Its secondary purpose is to act as a storage receptacle.

NEVER blow through the tube of a transit or level after the lenses have been removed, if the tube contains cross-hairs, as a vigorous blast will blow out the cross-hairs as well as any accumulated dust. The latter will do no harm if the lenses are clean.

A FEATURE of mine development too often overlooked is suitable provision for drainage of drifts, crosscuts, etc. A drain should be provided in all such cuttings—either in the center, under the tracks, or at one side. Not only is it necessary to provide such drains, but they should be kept open. Often haste to make headway is responsible for lack of drains, and for poor timbering, both of which later become more expensive than if properly attended to at first.

ORDINARY SOLDER, it is claimed, can be employed in soldering aluminum, if the surface is previously prepared by melting together at a low red heat and mixing ten parts of soft solder made of tin and lead, five parts pure zinc and six parts aluminum.

A COMPETENT LEGAL AUTHORITY states that the stockholders of a mining company which have failed to perform the required assessment work on unpatented claims, thereby losing title to them by default, may relocate such claims in their own names.

THE character and value of the surface outcrop of a vein is not a safe or reliable index of what may be found in depth. A poor, low-grade outcrop may overlie a rich orebody, and a rich deposit at the surface may prove to be only superficial in character.

IF the tables issued by the manufacturers of plow-steel ropes are reliable, a hoisting rope of this class will break of its own weight in suspension when 60,000 ft. in length. An inch plow-steel rope breaks under a strain of 47 tons, and a 2-inch rope breaks at 189 tons.

THE so-called free-milling quartz gold ores of California contain on an average of 2% sulphides, principally pyrite, which assay from $20 to $200 per ton. Much of this is concentrated on machines and the concentrates treated by the Plattner process of chlorination or shipped direct to the smelters.

WHERE borax minerals occur in vein form—intercalated in sedimentary beds, which have been uplifted—the vein may be located as a lode claim; but where the mineral occurs in the bed of a recent dry lake, as those near Calico and in Death Valley, the claims are taken as placers, in the usual manner.

TO CUT a glass water-gauge, wet a new three-cornered file, draw it several times around the place where it is desired to break the glass; then hold the tube firmly in both hands, the thumbs on either side of the file-cut and bend the glass. If the filing has been properly done, the gauge glass will break as desired.

THE small adjusting screws of drawing and similar instruments, which become rusted or work hard from other causes, may be placed in good condition by running the point of a sharp pencil around the thread, which is much better than oil of any kind, as there is no danger of soiling a drawing by contact with it.

WHERE A locates and works a placer claim and abandons it, and subsequently B makes a lode location on the same ground, so long as the lode location has a legal standing and the law is observed, A may not again locate the placer. Lodes may be located within placers, but placers may not be taken within lode claims.

UNDERHAND STOPING is not ordinarily practiced, but this method of mining is occasionally resorted to to secure ore discovered in a drift at some distance from a shaft. It is seldom attempted except on rich ore. Perhaps the better method would be to sink a winze on the orebody and remove the ore by overhand stoping.

NO TITLE can be obtained to town lots staked on a valid and legally subsisting mining claim without the consent of the owner of the mine. In new districts much litigation sometimes results from the wholesale appropriation by many of town lots on the previously located mining claims of others. Such has been the case at Tonopah, Goldfield and elsewhere.

MORE than one machine may be clamped to a single bar in either shaft-sinking or drifting. In a shaft 10 ft. square it would probably be found difficult to set bars sufficiently rigid for the successful operation of large machine drills, owing to the excessive vibration of so long a bar. Tripods could be utilized in such a case, but they are less satisfactory than bars for shaft work.

THE Government of the United States coins silver and other metals in accordance with the statutes regulating the coinage. A large proportion of the silver mined is coined, but it is mostly for countries of the Orient and India. The output of copper for the world in 1904 was about 640,000 metric tons. It is used mostly in electrical work and in the manufacture of brass and other alloys.

NO mine should be operated without carefully prepared maps showing all the workings, longitudinally and in cross section and plan. They should indicate the character of wall rocks, the width of the vein and any other physical features of importance. It is dangerous to carry on mining operations in proximity to old flooded workings without being provided with good maps of such old workings.

THERE is no law in California, so far as known to 'Concentrates,' which requires that air-compressors or receivers be equipped with a safety valve. The necessity for such attachment is so evident that no one of experience would think of attempting to run a compressor without a safety valve any more than without a pressure gauge. A safety valve will work on an air compressor in exactly the same way as on a steam engine, and is just as essential to safety.

THERE has been practically no commercial production of antimony in the United States since 1901. The tariff on antimony was removed in 1902, which gives foreign antimony, including stibnite (antimony sulphide), free entry into this country. The price of the metal at present is 13 to 14c. per pound. The principal use for antimony is in the manufacture of alloys with tin, lead, zinc, and other metals. The total consumption of the metal in the United States does not exceed 4,000 tons. An antimony mine must be most favorably situated to compete with existing conditions.

THE most frequent cause of accident in handling nitro powders is in thawing it. Nitroglycerine compounds become comparatively harmless at about 40° F. and do not explode readily at that temperature. It is in the effort to soften the frozen powder that the danger lies. Open fires, ovens, and direct steam heat, should be avoided, as well as the tops of stoves, boilers, cylinders of both engines and compressors. The powder should be placed in a can set in warm water, and carefully covered. The powder thaws slowly but effectually, and the operation can be performed without danger.

THE greater part of the world's demand for pumice is supplied by a deposit in the northeast part of the Lipari island, in the Mediterranean. A large deposit of pumice in Nebraska, and another in Utah, supplies a great part of the demand in the United States, the remainder coming mostly from the Hawaiian islands. Pumice occurs in a number of places in southern California, on the Colorado desert, and also in the Great Basin in Nevada. The amount of pumice mined in the United States is less than 1,000 tons annually, worth about $3 per ton. The quantity imported varies greatly—from none to upwards of $80,000 per annum.

IT is doubtful if a kiln can be built at small cost which will roast sulphide ore satisfactorily and which would be continuous in its operation. The mechanically rabbled reverberatory is one kind of furnace that accomplishes this, also several types of multiple-hearth furnace. Beside these are rotary furnaces, such as the White-Howell and the Bruckner. Heap roasting or stall roasting is the best for those having small capital, or not desiring to invest too great a sum in equipment. The Alaska ore might be burned in heaps before stamping. This would desulphurize some of the pyrite and render the ore subject to more rapid crushing.

A TWO-COMPARTMENT SHAFT, 5 by 11 ft. in the clear, requires about 1,000 ft. of timber, board measure, to the set. This includes the heavy timbers (wall-plates, end-plates, divider, four-posts, and the necessary lagging, blocking, ladders, etc.) Shaft timbers are framed by hand generally, and the framing is therefore slower and more expensive, than where machines are used in framing timbers for square sets. The length of time required to put a set of shaft timbers in place depends on the character and condition of the ground and on the experience of the men. Ordinarily a set of timbers may be placed in an inclined shaft in less time than is required to place them in a vertical shaft.

IF we had sufficiently good eyesight to detect the temporary cessation of motion in Polaris, the time of greatest elongation could be determined by that means. As an instrument is necessary, however, to determine the variation, it might as well be used in determining the elongation *with* an instrument (transit). The method is as follows: Fifteen to twenty minutes before time of eastern or western elongation (found from the solar ephemeris), have the transit set up and carefully centered over a stake previously driven and marked with a center-point. Bring the vertical hair to cut Polaris and follow the star along to right or left, as case might be, by means of the micrometer screw. Approaching elongation, the star appears to move more slowly, and finally moves vertically upward or downward along the vertical hair. Careful observation is required here, and the angle can be read at leisure.

EFFORTS made to ascertain whether the increase of temperature with depth is uniform in mines throughout the world have shown that it is not. The rate of increase is apparently dependent to some extent upon the character of the rocks intersected by the shaft, but more so by local conditions. The deepest shaft is a little over 5,000 ft. The deepest bore-hole is something over 6,000 ft., yet this is but a mere pin-prick in the crust of the earth. Assuming the solid crust to be 200 miles in thickness, then a shaft a mile deep would penetrate but one two-hundredth of this distance—the outer crust or shell. In a globe 20 in. in diameter representing the earth, the 200 miles of solid crust would be a shell one-half inch in thickness, and the shaft, 5,000 ft. deep, would be but a scratch. On such a globe the coat of varnish covering the ocean would be proportionally equivalent to a sea about 12,000 ft. deep. Many ideas have been advanced by scientists dealing with conditions in the interior of the earth, but they are at best theories and nothing definite is known of them.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir — This discussion might perhaps be better termed the best shape for a particular shaft, since it relates chiefly to a concrete instance of a shaft 10 ft. square and 320 ft. deep which has to be sunk to an ultimate depth of 2,300 ft. Mr. Burrows proposes to use the old portion of the shaft for two hoisting ways each 4 by 5 ft. and at its bottom to add at one end a pump and ladder-way 5 by 5 ft., while Mr. Storms suggests a very practical but perhaps costly method of utilizing the present 10 by 10-ft. shaft and carrying it down that size for the entire depth. I would point out that the depth already sunk is only 13.9% of the entire distance, and that it might be well not to let the tail wag the dog.

Judging from experience, the best shape is that suggested by Mr. Burrows of 5 by 16 ft. The 'jog' alluded to by that gentleman should be made of spiral shape, the roof reaching up perhaps 40 ft. before finally curving into the unused space of the present 10 by 10-ft. shaft. This will allow of easy bends in the water column, air-pipes, etc., and a ready transfer of the ladderway, while avoiding any necessity of ever stripping the upper portion of this old shaft which can remain as it is.

It is, of course, assumed that pumping will be done by electricity as in deep shafts on the Rand, where it has not been found necessary to have an extra engine for handling the pumps and pipes. This can all be done perfectly well from the main hoisting compartments, and after the pipes are once installed in their stations and the water-column in place, there is little or nothing to be done in that compartment requiring the use of a hoisting engine.

As Mr. Storms points out, the 10 by 16-ft. shape is quite out of the question as unnecessarily large and much too costly. It is as extravagant to sink too large a shaft as it is to instal a 1,000-h. p. engine to do 500 h. p. of work, and even more so. That is to say, a shaft must be worked to 100% efficiency, or as near to that as may be, and not be sunk of such a size that it can never be called upon for more than 40 or 50% of its capacity. The 10 by 10-ft. shaft would require the breaking and hoisting of 25% more ground than the 5 by 16-ft. and to no purpose, since the ground that can be handled through two well-equipped hoisting compartments is enormous.

The record cited by Mr. Storms from my paper on deep-level shafts has now been exceeded at De Beers and by a very considerable tonnage from a greater depth, but I have not the figures at hand.

As to greater facility in breaking the ground in a square or round shaft, this advantage is more theoretical than practical and I know of no place where they have beaten the shaft-sinking record of the Transvaal in rectangular shafts, namely 203 ft. sunk in one month.

The method of timbering, to so speak of the steel I-beam dividers, etc., suggested by Mr. Storms, is ingenious. More room could be obtained, however, by using dividers but four inches wide on the flange (instead of eight inches) which would be amply strong. The steel framing would, however, be expensive, while according to all information the character of the ground does not call for such strength of material, and it involves the sinking of an unnecessarily large and therefore more costly shaft, not to mention the sacrificing of 86% of the permanent shaft in order to make it conform to the existing 14 per cent.

As regards size of hoisting compartments for shafts 2,000 ft. deep, or more, I much prefer a compartment 5 by 6 ft. instead of the proposed 4 by 5-ft., but I have no doubt the latter can be made to answer all requirements.

THOS. HAIGHT LEGGETT.

San Francisco, March 6, 1906.

AMALGAMATED PLATES.

The Editor:

Sir—The introduction of the use of amalgamated plates was one of the most important steps in the progress of gold-milling operations. Yet there seems to be nowhere in the literature of that important subject an exact statement as to where, when, and by whom they were introduced. It is to be hoped that someone familiar with the facts of the case will present them, so that they may become a matter of record, before the generation which can speak from knowledge passes away.

THOMAS T. READ.

New York, March 2, 1906.

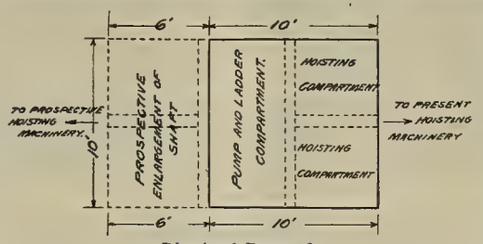
[We trust some of our readers in California will be able to give the information required. The use of plated copper in stamp-mills originated in California, and there is reason to believe that copper tables were used here first, the earlier Georgian practice being based on the use of blanket strakes.—EDITOR].

THE BEST SHAPE FOR A SHAFT.

The Editor:

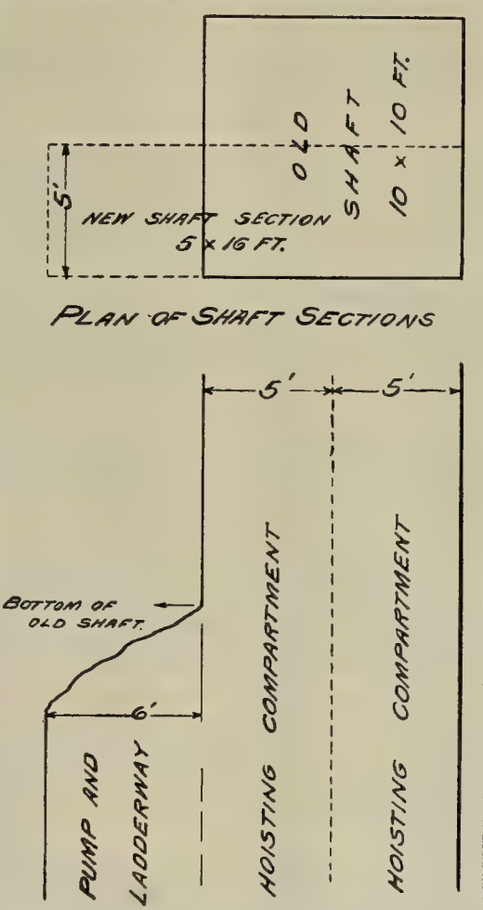
Sir—The interesting letter of R. H. Burrows in your issue of February 24, on 'The Best Shape for a Shaft,' re-opens a subject that has been often discussed by mining engineers.

Under the circumstances described by Mr. Burrows as existing at his mine, it does not entirely meet the case to say that the accepted practice in all the newer mining regions of the world is to sink shafts whose cross-section is long and narrow rather than that which is wide and approaches a square. In this



Directors' Proposal.

instance it is planned to sink to a depth of 2,300 ft., utilizing an old shaft 320 ft. deep by 10 ft. square which happens to occupy the site chosen. A difference of opinion arose between the management and the board of directors. The manager proposed to sink from the bottom of the old shaft with a section of 5 by 16 ft., comprising two hoisting-compartments 5 by 5 ft. each, and a ladder and pump-way. Thus only one-half the section of the 320 ft. of



Manager's Proposal.

old shaft would be utilized. The directors favored the plan of using the entire section of the old shaft, a large pump-way lying against the ends of the two hoisting-compartments.*

The writer of the present communication distinctly favors the manager's plan. In carrying it out there would be some inconvenience in handling pumps and piping during installation and possibly in making repairs, but the timbering would be of stronger and better design than for the square section and would cost less. Furthermore, any subsequent enlargement for adding more hoisting-compartments could be made equally well and at a smaller cost.

The particular problem presented here may be considered from four points of view:

1. *Timbering.*—It is stated that the ground is sufficiently firm to make wall- or end-plates unnecessary. Therefore, in a long and narrow shaft one end-plate and two dividers only, set in hitches in the walls, would be required. These dividers and end-plate would carry the cage guides and being short would provide an efficient general support for the walls at 5-ft. intervals across the shaft.

For the square shaft, on the other hand, the hoisting-compartments are so placed that, if cages and guides of ordinary form be used, two 5-ft. wall-plates, in addition to one short divider, would be necessary to support the guides. The quantity of timber in these plates and divider would be the same as for the three timbers per set for the long section, and in addition there must be a center divider of double length (10 ft.). Besides, to furnish equal strength, the 10-ft. divider would have to be of larger section.

On the basis of 8 by 8-in. timbers, set 6 ft. apart vertically, which would probably be suitable for the conditions specified by Mr. Burrows, 1,335 ft. of timber, board measure, would be required per 100 ft. of shaft of the long section, as against 2,220 ft. per 100 ft. of the square section. (It may be noted here that 8 by 8-in. and even 6 by 6-in. timber has been used satisfactorily on the Rand for important shafts.)

In this estimate no account is taken of the extra length of timber required for hitches, which would be nearly the same for both cases; nor of the possible larger size of timber for the 10-ft. center divider of the 10 by 10-ft. shaft; and, as complete ring sets are not required, both posts and lagging would be omitted.

2. *Drilling and Blasting.*—It was urged in favor of continuing the 10 by 10-ft. section that a deeper cut could be made than in an area of 5 by 16 ft. This is questionable for the following reasons: A substantial advantage of a long section is that the width of collar between the two lines of center-cut holes may be made relatively great, while still allowing ample room for setting up and operating the drills. That is, the vertical angle between the rows of cut holes is large and for the same vertical depth per round less explosive is required. By laying out to scale the two shaft-sections, with their vertical projections, it will be seen that for a 10 by 10-ft. section the width of collar could not be much more than 2 ft. 6 in. This would leave a width of only 3 ft. 9 in. on each side for setting up the drills. And in this space two side rounds would have to be put in, since it is extremely improbable that a single side round would break the ground, even with heavy charges that would tend to shatter the walls.

For the 10 by 10-ft. shaft I should estimate ten holes (five on a side) for the center cut, and two rows of four holes on each side to square up: total 26 holes. For the 5 by 16-ft. section a maximum of eight holes would be required for the cut, with two rows of three holes apiece on each side for squaring: total, say, 20 holes. The vertical angle between the rows of cut holes could be made nearly double as great as for the 10 by 10-ft. section; and the charges could therefore be smaller, beside enabling the holes to bottom up better.

As to the amount of rock to be broken and mucked per round, I think Mr. Burrows is right in maintaining that in ground that drills well the total speed of sinking depends more on the volume of ground to be mucked and hoisted than on the total linear feet of hole to be drilled. Assuming the weight of rock to be at the rate of 13 cu. ft. per ton, there would be 7.7 tons per foot of shaft to be mucked in the 10 by 10-ft. shaft, and 6.15 tons per foot in the 5 by 16-ft. shaft. Without knowing the local conditions, an exact comparison in figures cannot be made either as to blasting or mucking, but the above considerations point to a substantial difference in favor of the 5 by 16-ft. section.

3. *Convenience of Laying Out Shaft Stations.*—As long as the shaft has but two hoisting-compartments the conditions in this respect would be about the same for both sections; but referring to the sketch in Mr. Burrows' letter of the enlarged 10 by 10-ft. shaft, the provision for two additional compartments materially alters the case.

The pairs of hoisting-compartments are back-to-back on opposite sides of the shaft, with the pump and ladder-way between them. The landings are consequently separated, and to connect them a large drift must be made around at least one side of the shaft. The cars must be run off the cages in opposite directions, and more curves therefore become necessary in the tracks connecting with the crosscut to the vein. All this will cost more, and it will be more inconvenient to handle the cars at each station, than for a four-compartment shaft made by increasing the section of the 5 by 16-ft. shaft to, say, 5 by 26 ft. In the latter case the landings will be side by side and much more easily arranged with respect to the main crosscut.

4. *Surface Plant.*—The matter of the relative positions of the shaft-stations is directly connected also

*It would appear that an error was made in printing Mr. Burrows' sketches illustrating the proposals of the manager and of the directors. The titles of the sketches should be reversed.

[Professor Peele is quite right. We re-publish the two drawings referred to, and this time they are correctly labeled. Although the titles were transposed, the text was so definite as to have prevented confusion.—EDITOR].

with the design of the hoisting plant at the surface. For the 10 by 10-ft. shaft it would be difficult to avoid the construction of two engine-houses on opposite sides of the shaft and separated by a distance of say 150 ft. The boiler-house would be either close to one engine-house or between the two. For such a plant the cost of installation and running expenses would evidently be greater than for the other design, in which the hoisting-compartments are side by side, and the engines will be placed in a single larger building.

It is superfluous here to consider the design of the hoisting plant and the question of steam economy, further than to say that for a single engine-house the four drums might be driven through friction-clutches by one constant-motion engine, while for the other design two independent engines would of course be required.

In conclusion, Mr. Editor, though the subject is far from being exhausted in this communication, the weight of advantage appears to me to be decidedly in favor of the 5 by 16-ft. shaft.

ROBERT PEELE.

School of Mines, Columbia University, New York, March 6, 1906.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—As one of the mining fraternity referred to by R. H. Burrows in his communication in your issue of February 24, I am inclined to make a few remarks.

The problem troubling your correspondent was briefly, whether it were the wiser to continue a three-compartment 10 by 10-ft. vertical shaft now 320 ft. deep, or to remodel it into a 5 by 10 shaft of two compartments (cutting off an area 5 by 10) to present depth, and thence adding, at one end, a third compartment (5 by 6 ft.) as a pump and ladder-way; the former plan being proposed by the directors; the latter, by the manager; the contemplated ultimate depth to be 2,300 ft., and the capacity 1,000 tons per day.

The manager's plan is decidedly the best, for the following principal reasons:

1. The 5 by 16-ft. shaft is easier timbered, is more rigid, and when in bad ground is more readily secured, than a 10 by 10-ft. shaft.
2. The 5 by 16-ft. shaft will be sunk and timbered for less cost than the other.
3. The position of the 4 by 10-ft. pump and ladder-way in the 10 by 10-ft. shaft, back of the two hoisting-compartments, is very undesirable, not being convenient of access and rendering the hoisting-compartments accessible only on one side.
4. Cage-ways should always be free to open out in two opposite directions, at stations.
5. The two hoisting-compartments in the 5 by 16-ft. shaft can handle 1,000 tons daily, if necessary. It is simply a question of equipment.
6. If a third compartment for hoisting becomes necessary, it may be added at one end of the 5 by 16-ft. shaft, to better advantage than the 10 by 10-ft. shaft can be enlarged.

One feature I am surprised your correspondent does not suggest. If his property warrants so large a shaft to a possible depth of 2,300 ft., it should warrant carrying his 5 by 6 pump-way to the surface to start with, in his proposed 5 by 16 shaft, and thus do away with the "jog at the bottom of the old shaft."

T. E. SCHWARZ.

Denver, March 3, 1906.

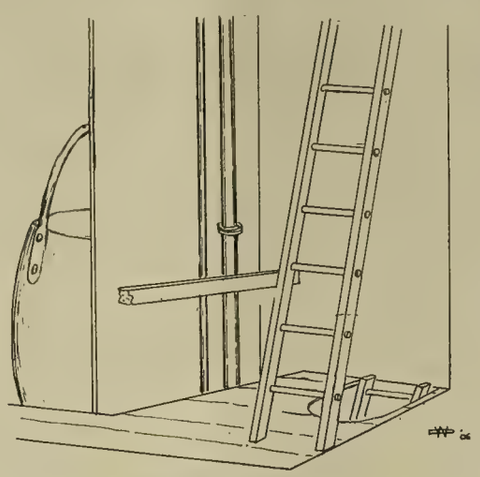
MAKING MINE LADDERS.

The Editor:

Sir—Mr. Alderson is to be congratulated on his practical article on mine ladders, one of the minor economic subjects that generally do not receive enough attention. A note or two from Nova Scotia may be of interest. In that country, where the metal mines are not usually of great depth, and where cages are seldom used, the ladderway is the chief means of entrance and exit to and from the mine. The mining regulations require that it shall be made efficient and specifically stipulate that ladders shall not be placed in a vertical or overhanging position, on the contrary they must be placed at as flat an angle as the man-way will allow, and must have platforms placed at intervals not greater than 60 ft. In the annual report for the past year it has been recommended, among other changes, that this distance be altered to 20 ft. A fall to a depth of 60 ft. has often resulted in effects as injurious as a fall of several hundred feet.

One of the best examples of a properly equipped ladderway that has come under my notice is at the Bluenose mine at Goldenville, Nova Scotia. The shaft which is practically vertical—at 87° to the horizontal—is over 500 ft. deep and is divided into two compartments—one for the tub or bucket, the other for ladders and pump. The ladders are a little over 20 ft. long and, if I remember rightly, are constructed of 2 by 4 in. uprights with rounds of iron pipe placed at intervals of 12 in. The ladders are given the greatest inclination possible and the manholes are placed directly under the ladder and each other. These are semicircular in shape, a little wider than the ladder and about 24 in. from front to back. This arrangement necessitates stepping round from bottom of ladder to man-hole, but in a climb of 400 ft. to 500 ft. this is a grateful pause. Moreover, this arrangement consumes no more time and is not more irksome than when hatches are used on a continuous ladder-way, nor is it so dangerous as the 'staggered' form of ladder-way where the ladders and man-holes are placed alternately at opposite sides of the shaft. The pump-discharge and air-pipes, etc., were also contained in this compartment, but were separated by a hand-rail. The rule at this mine preventing men from riding on the tub was strictly enforced and they were allowed ten minutes for entering and the same time for leaving the mine.

It will be observed that in the above method, splicing is not necessary, as the ladders rest independently on the platform and wall or the timbers of the shaft. In splicing in an inclined shaft, dependence should not be placed simply on the strips connected by nails to the uprights, but the ladders should also be connected by proper hooks and in a continuous ladder-way every second ladder at least



Shaft and Ladder-way.

should be strongly and independently fastened by spikes or otherwise to the shaft timbers.

I do not agree in not 'gaining in' the ends of slats in mine ladders. As Mr. Alderson himself states, the nails rust and if not 'gained in' a nasty fall is likely to occur on the slat giving way. The very swelling mentioned is a source of safety. The timberman or mine carpenter on his rounds always has, or should have, the few tools with him necessary to get the broken slat off the uprights.

D'ARCY WEATHERBE.

San Francisco, February 26, 1906.

PYRITE SMELTING WITHOUT COKE.

The Editor:

Sir—I have read with much appreciation Lewis Wright's article on 'Pyrite Smelting Without Coke,' printed in your issue of February 24. It is very interesting, but would be more valuable if the writer had not omitted some important matters, which I hope to be excused for calling to his attention.

It is desirable to know what fluxes were used. He speaks of a varying percentage of flux, but without saying what kind it is. How much limestone and silica does Mr. Wright add to his charges?

Second—How many tons of the different charges spoken of went into a single ton of matte? This is very important to know, as without this knowledge all his figures go for nothing.

Third—How much do the slags assay? Unless the slags falling from the higher concentration charges are cleaner than customary, it might not pay to run a matte of converting grade at the first turn-out of the box. Some have found it to pay better to make a low-grade matte at first and to re-concentrate it afterward, instead of trying to produce a richer product at first.

Fourth—How hot does Mr. Wright run his blast? The meager information that it requires from 1 to 1.25% of fuel, based as coke, to heat it is hardly sufficient, as so much depends on the apparatus used.

We can scarcely expect business matters to be revealed, or I would ask about the cost of smelting at Keswick. It is known that a great many men are employed there, some say one man to each ton of ore reduced in a day. This can hardly be so, or the gentleman would not bring the plant forward as something to be studied and written about, but we may ask for just a few figures about so interesting a work. Thanking Mr. Wright for the pleasure he has given me, and expecting further enlightenment.

R. RODGERS DECEMGE.

Prescott, Arizona, March 10, 1906.

Steam-Shovel in Copper Mining.

At the Cactus mine, in Beaver county, Utah, the steam-shovel is being used successfully and we learn that a similar machine is to be put to work shortly on the disseminated copper ore in the monzonite formation of Bingham. The Cactus mine is on the western slope of the San Francisco mountains, near the new town of Newhouse and four and a half miles northwest of Frisco. It lies on the western slope of this 'Basin range.' The deposit is essentially a pyritic impregnation of a zone of fracture in a body of monzonite, locally known as 'granite.' This is intrusive in limestone. The ore is mainly pyrite with chalcopyrite, and contains but little lead or zinc. The orebody is stated to be from 100 to 175 ft. wide and 700 ft. long.

The ore is first disintegrated by blasting and is then moved by the steam-shovel. Holes are drilled 25 ft. deep and 10 ft. apart. After chambering, they are filled with black powder and fired. The material thus loosened is loaded into 24-ton Thew cars with the steam-shovel, having a ¾ cu. yd. bucket. This handles 400 tons in 10 hours and is now being worked by day and night shift. So far, the steam-shovel has been employed only in stripping the overburden, but it is soon to be started on milling ore. For its operation six men are required, one operator and two attendants, and three trammers. Four men do the drilling. Compressed air is used as power because of the lack of water fit for boiler purpose. The cost is said to be less than 40c. per ton in stripping, and it is to be further reduced by re-heating the air.

The mine is worked by the Boston Consolidated Mining Company, of which Lafayette Hanchett is manager. This same company now has a 95-ton Vulcan shovel at Bingham Canyon and is awaiting the completion of the railroad to its mines before starting work. The Utah Copper Company has a similar shovel in readiness to work adjoining ground and the Boston Consolidated has placed orders for another. These will first be used in removing the overburden and afterward in mining the ore itself.

This ore also is porphyry impregnated with copper sulphide, averaging 2% copper. It is to be crushed and concentrated; the concentrate being smelted at the new Garfield works, which are expected to be running in June. These two companies confidently expect to be able to move 10,000 tons of ore per day within the next six months.

Copper River, Alaska.

A most important element to consider in relation to the future development of this region is the probable condition of the deeper-lying ores and the presence or absence of bonanzas. In 1900, when Messrs. Schrader and Spencer examined the Nikolai mine, a shaft had been sunk to a depth of 30 ft., and a tunnel in the Warner prospect, which has now been driven 18 ft., was examined in 1902. Except in these two cases we have no evidence as to underground conditions in the region itself, but reasoning by analogy from other regions on the basis of the surface conditions prevailing in the Nizina valley, certain probabilities may be indicated.

Climatic conditions are believed by geologists generally to be potent factors in the alteration of mineral deposits by surface water, in the oxidation of a surface zone, the leaching of this oxidized zone, and the re-deposition of the derived products in depth, as oxide or sulphide enrichments. The low temperatures of interior Alaska at present and the lower temperatures, or at least the more uniformly low temperatures, during the recent geologic past, when glaciation was much more extensive than now, are conditions unfavorable to those chemical processes, to which certain important enrichments—the secondary bonanzas of many copper camps—are believed to be due.

The region is extensively glaciated, but the present glaciers are but insignificant remnants of their predecessors. Probably no single occurrence of ore has been described which has not recently been buried under an ice mass and subjected to an unknown amount of ice erosion, resulting in the removal of those surface forms of the ores which may previously have accumulated.

The present surface ores are usually the richer sulphides, bornite, and chalcocite. No gossan cap over any of the veins and no extensive deposits of oxides or carbonates have been observed, the latter minerals, where seen, being mere surface films and obviously due to recent atmospheric action.

It is probable, then, that there has been no deep alteration, because of climatic conditions, and that glacial action has recently removed much of that shallow altered zone which perhaps did exist, these conditions together resulting in the presence of bornite and chalcocite as the surface ores, and leading us to expect no general increase in richness with depth. The present surface zone is the one that corresponds to the bonanzas due to secondary enrichment, in mines further south, and the changes to be expected in deeper explorations are changes from the richer sulphides to chalcopyrite.—Walter C. Mendenhall, *U. S. Geological Survey.*

Improved Shaft Equipment.

Written for the MINING AND SCIENTIFIC PRESS by S. A. WORCESTER.

The arrangement which is here described and illustrated is one which I recently designed for the Golden Cycle Mining Company, at Cripple Creek, and is to supersede an arrangement using cages and tramming cars by hand to the ore-house, an average distance of 150 ft. The new arrangement will save, probably, $9 to $15 each 8-hour shift. The plant will be used for handling ore only, all men, timbers, supplies and waste being handled through a nearby shaft. The skip-boxes are made of ⅜-in. plate, with a bottom lining of 2-in. oak covered by ½-in. plate, and have a capacity of 50 cu. ft. each. The ore averages 21 cu. ft. per ton, so that a load of two tons does not quite fill the skip and there is no need of spilling ore down the shaft. Aprons 16 in. high at the sides of the skip-boxes prevent ore from falling down the shaft when piled high in the center of the skip. The mine-cars are dumped directly into the skips. The skip-frames are constructed so that if at any time it is desired to use them as cages, for handling machinery or any other purpose, the boxes can be easily removed by withdrawing the pivot shaft, when, by placing a wooden false floor on the cross-bars, a complete cage is the result. Slanting oil-holes are drilled in the ends of the pivot shafts, which are stationary in the frames, and the bearings can always be oiled, whatever the position of the skip-boxes relative to the frames. Oak foot-boards are placed at the top of the skip-frame or cross-head for the skip-tender to stand upon and a bonnet is provided for protection from falling objects. The bonnet is supported by rods above the skip-frame and has shoes embracing the guides. The safety-dogs are steel castings with planed teeth; the springs are protected from injury when dumping cars into the skip, or from any other cause, by placing them between the two 8-in. channels which form the top or cross-head of the skip-frame. The guides which engage the rollers on the skip-body for tipping and dumping it are curved to a 6-ft. radius for about one-half their length, and a 3-ft. radius for the remainder, so that as the motion of the skip is retarded near the end of the trip, its dumping movement is accelerated. This reduces the strain on the parts and the liability to accident, and causes the skip to right itself gently. A bin, having a capacity of five to six loads, receives the ore from the skips. The upper part of the bin is lined with ¼-in. steel plates, and the lower part, which is subject to the greatest wear and severest blows, is lined with ⅜-in. steel. The gate, with an opening of 20 by 30 in., is made of ½-in. steel, re-inforced by heavy angles, and is operated by a 6 by 20 in. air cylinder, controlled by a four-way cock within convenient reach of the operator when standing on the car-platform and with the car in position for filling and for charging with air. The inclined bin-gate has less tendency to wedge ore against the adjacent slope than the vertical style and is more satisfactory in operation. The side-dump ore-car is propelled by an air-locomotive with 7 by 7 in. cylinders, having balanced valves and a simple reversing and throttle valve, similar in action to the type of valve generally used on steam elevators and like machines having only one controlling lever for the engines. The engines are built into the truck-frame and are of extremely simple construction and few parts, so as to be adapted to rough usage. When the car is brought under the bin, with the bumpers in contact, the automatic air-coupling opens two valves and the receiver, 28 by 72 in., on the car, is charged in a few seconds, without any attention from the operator, who stands on a platform between the engine cylinders, with all levers within easy reach. When the car starts the coupling-valves close automatically and prevent any escape of air. The car is assisted in starting by the air-pressure on this coupling, which amounts to nearly 500 lb., tending to separate the two parts of the coupling. Air is supplied by the mine compressors at about 100-lb. pressure. The car is stopped and held securely by a powerful brake at the operator's right hand. The brake-lever has a notched quadrant and a thumb-latch and the brake can be set so as to prevent the car from moving, which might occur when charging. Several reasons led to the adoption of air as a motive power: The nearness of compressors of ample capacity and the fact that an air-connection was necessary for operating the bin-gate; also it was not deemed advisable either to instal a special generating plant or to buy current for an electric motor; furthermore, an air-locomotive of extremely simple construction involves less outlay than an electric motor of equal torque; the shortness of the trip, averaging only 150 ft., makes the air-consumption necessarily small. As the operator must travel with the car, in order to see and regulate at all times the dumping operation, and to see that the grizzlies are kept clear and the bins properly filled, the only form of cable haulage that seems to apply practically is one using an endless rope and having two lever-grips on the car, one for the out-going and one for the returning cable. Some of the objections to this plan were, that the short turn of about 60° from the bridge into the ore-house would require a number of idlers and cause much wear on the cable and side strain on the grips; the haulage engines, sheaves, cable, etc., in the aggregate, would be more expensive than the air-locomotive; the power consumption would be greater for keeping the cable in constant motion than for making the intermittent trips with the locomotive; and the speed would be limited to that of the constantly running cable.

A review of some of the faults of older plants which are avoided by this one will be profitable: In one instance coming under my observation, counter-balanced skips dump directly into a car which go to the ore-house. Criticisms which apply to this arrangement are: (1) When the skips are hoisting the short distances from the upper levels, the car cannot make its trip quickly enough and the skips have to wait awhile at each trip. (2) If for any cause, such as, for instance, a clogged grizzly, requiring to be cleaned, the car is delayed, and skips are also delayed until it returns. (3) When the skips are delayed for any cause, the ore car is also idle and must wait for a load. In one case, where a skip dumps directly into a car, I noted that the operator's platform was placed at the rear of the car, so that it passed partly under the supposedly empty skip at each trip. On several occasions rocks of considerable size hung in the skip, and fell just as the operator was passing, and the rule was finally passed that the engineer must lower the skip far enough to avoid this danger before the car is allowed to start. This delay I easily avoid by placing the platform at the front of the car. In the instance just mentioned, the electric motor of five horsepower is geared to the forward axle only, and the two driving wheels slip during the first 10 to 30 ft. of the trip, so that the car loses time at starting. Placing the platform at the rear aggravates this trouble by throwing the weight more on the rear wheels and away from the drivers. The Golden Cycle plant has sufficient capacity in its dumping bin for 15 to 20 mine carloads and the fact that the car can always load at once from the bin without waiting for a skip enables it to keep constantly busy. In this way it gains a little each time the skip-tender uses the skip in going from one level to another, or the skip is delayed for any other cause. The immense starting pull of the car and its powerful engines enable it to make trips at the highest allowable speed; all four wheels being drivers, the slippage is reduced to a minimum.

Increased Cost of Metal Work.

Lamps, electroliers, art products and novelties of various kinds in the making of which copper, tin, brass, bronze and spelter are used, are advancing in price. Several manufacturers in New York have already sent notices of this to the retail dealers, and others will do so. Importers whose buyers have returned from the markets of Germany, France and Austria say that the prices abroad are much higher than a year ago. The public will pay more for these wares, imported and domestic, when the spring season opens.

The advances range from 10 to 25%, according to the amount of metal used, especially copper. In explanation, a manufacturer said today: "The raw copper is three cents a pound higher than a year ago, tin seven cents, lead one cent. Iron and steel also cost us more than last year. Such advances in the raw material mean more than can be readily figured. In refining and preparing the metal for use there is a constant loss in weight. If a lamp weighs six or seven pounds and sells at retail for $8 or $10, it might be supposed that a difference of three cents a pound in the raw material would not be of any consequence. But the amount of metal used is much more than the weight of the lamp in its completed condition."

Clock manufacturers say that those who have not yet put up prices of cases made of bronze and other metals are contemplating such action. The head of one firm said yesterday that if copper continues at its present level, the material will cost his company at least $30,000 more this year than last. Others agreed that the situation demanded action to save them from actually losing money on their sales, so small is the margin of profit.

In architectural shapes, building ornaments, fences and similar products, in which the amount of the metal used is much greater than in the field of art, the advance is proportionate. There are quite a number of factories in New York in these lines, and all of them have been affected by the increased cost of the metals, especially tin and copper, brass and bronze.—*The Evening Post*, New York.

FILTRATION of fine precipitates and fluids, which are turbid from decomposition, due to micro-organisms, can be readily effected by the use of tripoli. All that is necessary is to shake up or triturate with the fluid a small amount or a definite amount of tripoli and pass through the moist filter or Gooch crucible. This tripoli is almost pure, SiO_2. Small blocks arranged with a glass tubing to act as a siphon have proved excellent and expeditious to filter clear troublesome liquids.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The white rock from Los Angeles, Cal., marked N. W. D., is rhyolite tuff.

Of the rock samples from Denver, marked H. & B. Co., the smaller piece is granulite, and contains grains of magnetite; the larger piece is largely soda-lime feldspar with a little quartz and mica. The black mineral with red streak is hematite, which is slightly magnetic, due probably to the admixture of magnetite grains.

The rocks from Stella, Cal., marked N. W. K., are: No. 1 a silicious talcose and limy schist of unusually fine grain. It contains finely disseminated pyrite. No. 2 is quartz-porphyry, which also contains pyrite. No. 3 is a felsitic dike rock in which there has developed by alteration much calcium carbonate. No. 4 is a cherty, metamorphic rock.

The rocks from Lost Cabin, Wyo., are the following: No. 1 sack contains a dark piece of silicious, much altered and iron-stained rock, and a greenish-gray rock, consisting principally of quartz and epidote. No. 2 sack contains a pink rock with a green mineral. The pink portion is orthoclase feldspar and the green is epidote. The other pieces of green rock in this sack are also epidote. No. 3 sack contains a white rock, a mixture of feldspar, and quartz with a little black mica, and is essentially granite. The brown rock in No. 3 is an iron-stained, fragmental rock cemented by lime carbonate. No. 4 sack contains a similar piece of brownish rock. The dark rock in No. 4 is a metamorphic rock, containing a large amount of iron oxide and epidote.

The rock specimens from Alleghany, Cal., are: A, amphibolite schist (talc schist); B, much decayed, apparently diorite; C, mostly quartz (metamorphic); D, a much-decayed rock, probably greenstone altered to clay and stained with iron oxide; No. 1, a greatly altered magnesian rock, with calcite and iron oxide; No. 2, chert; No. 3, dolomite, with a few crystals of pyrite; No. 4, mostly quartz—may contain gold; No. 5, quartz and iron oxide; No. 6, quartz, talc, iron oxide—may be auriferous; No. 7, talc schist; No. 8 and 9, similar to No. 6, but contains more magnesian material; No. 10, mostly quartz; No. 11, amphibolite schist; No. 12, flinty quartz, containing pyrite and stained slightly by copper carbonate; No. 13, psilomelane (manganese oxide, principally); No. 14, fine-grained amphibolite schist (commonly, though erroneously, called slate); No. 15, flinty quartz; No. 16, andesite; No. 17, diorite-aphanite. The contact between serpentine and so-called slate should be carefully prospected. Veins of gold-bearing quartz do not usually lie wholly within serpentine, though there may be exceptions. D would not ordinarily be considered a gold-bearing formation, but such ideas are prejudicial to the interest of the miner. The source of the gold is at least as high on the hillside as the highest point producing gold in the alluvial.

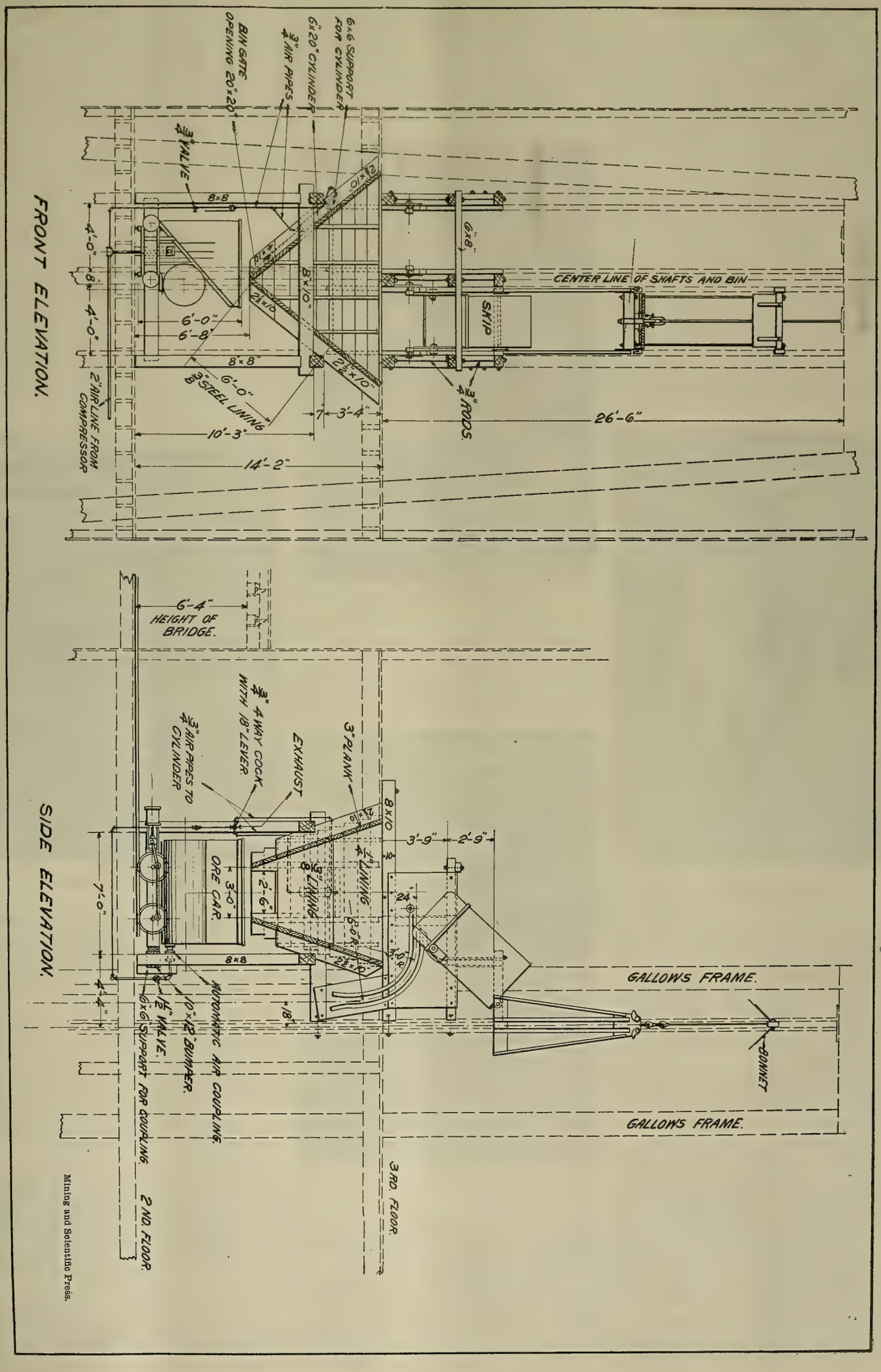
Electric Smelting of Iron Ore.

Recently extensive experiments have been made in electric smelting, particularly in Canada. At the Sault Ste. Marie, Prof. Haanel has been in charge of operations of this character. He lately telegraphed the Canadian Minister of the Interior as follows:

"Successful demonstration of all points stated in my memorandum on electric smelting of Canadian iron ores requiring investigation. Output greater than the figure adopted by Harbord in report of Commission. Successful smelting of magnetite and de-sulphurization of pig. Successful substitution of charcoal, and therefore of peat coke, for coke. Consumption of electrode insignificant. Production of nickel pig of fine quality from roasted pyrrhotite. Forty tons of pig have so far been produced. Process admits of immediate commercial application. Experiments will be completed in about two weeks."

(Sgd.) EUGENE HAANEL, Supt. of Mines.

IMPACT TESTS of steel are discussed at some length in *The Engineer*, of London, by Capt. Riall Sankey, who is of the opinion that they deserve more general attention than has been given to them. "The variation in the results obtained with the same steel," he says, "are undoubtedly considerable in any case, and are apt to scandalize those who are accustomed to quote tensile tests to the first or second place of decimals. The writer is not prepared at present to give any reason for these variations; but he knows that, notwithstanding them, those who have made a sufficient number of impact tests are prepared to rely on them as being a good guide to the quality of steel." This opinion is in line with the general belief of American engineers who have studied such tests carefully.



ARRANGEMENT FOR HANDLING ORE. GOLDEN CYCLE MINE, CRIPPLE CREEK, COLORADO.

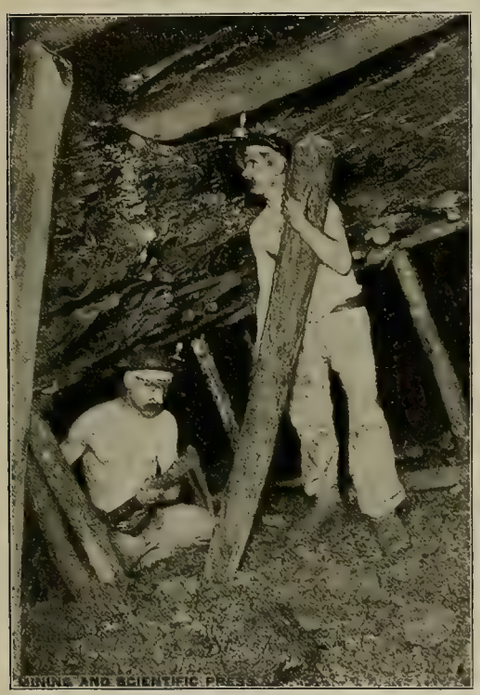
The Coal Disaster in France.

Written for the MINING AND SCIENTIFIC PRESS by DONALD F. CAMPBELL.

To one who is intimately acquainted with the Pas de Calais coalfield the news of the recent appalling disaster has its horror increased by its unexpectedness. The adjoining Belgian coalfield, which is now being worked at a depth of 4,000 ft., has always been notorious for its fiery nature, but hitherto the Pas de Calais has proudly boasted of the lowest mortality of the world's great producers.

The most striking feature which appeals to the engineer visiting this district is perhaps the lavish way in which the mines are equipped. On first approaching one of these large pits, the high walls and heavy gates tell at once of the frequent strikes and the substantial means adopted for the protection of the splendid machinery and structures.

When once inside the company's sacred precincts the cleanliness of the yards, the substantial nature of all the buildings and the enclosed pithead frames cannot but strike the visitor as remarkable. The universal use of flat, tapered hemp ropes and the descent in three and four-deckers cramped in little mine-cars will be a novel experience. The sumptuous surroundings here far excel the older Belgian coal basin which is situated a little further east. It



Timbering a Coal Face.

is indeed difficult to imagine how this terrible accident could have occurred in such a district as this, where almost unlimited sums seem to be available for the highest grade of equipment, where the best educated and most experienced of French engineers vie with one another to attain the greatest state of efficiency, where each department is also under the control of a man especially trained in his particular branch of engineering; in such a community it seems almost impossible to conceive how so great a number of men could have been within the danger zone arising from any one catastrophe.

The most prominent feature of the mechanical equipment is the centralization of all machinery. Thus, for instance, it is customary to have one enormous engine-room in which the hoisting-engine, fan-engines, compressors, and electric generators are placed.

Steam is generally used for the hoists, which are often over 2,000 h.p. The necessity for highly efficient engines will easily be recognized when it is remembered that one company alone is handling an output of three million tons per annum, and the whole of this is raised in small cars carrying less than half a ton apiece. From these great central stations three-phase generators distribute power to outlying pits, where it is usually transformed by static transformers and used for a variety of purposes. The compressors attain to a high state of efficiency and two or three-stage compression is the common practice, a splendid system for governing these great compressors being in vogue.

Ventilation is carried to an unusual degree of perfection, though in this department the French can not rival American practice. The commonest type of fan in this district is one of high speed driven by a steam-engine, and the whole plant is duplicated, the units being operated each alternate month.

In this remarkable coalfield the highest possible values are extracted from the mineral and the sale of coal is by no means the only source of revenue to the wealthy companies. Coke and the valuable by-products which are produced in its manufacture find an excellent market in the neighboring iron-producing districts and the great chemical works of

Women Preparing the Safety Lamps.

Germany. The coke ovens are usually equipped with regenerators, and the gas, having had all its values extracted in an extensive condensing plant under the supervision of experienced chemists, is thus utilized for the coke-ovens, any available excess being employed for raising steam. The manufacture of

Dinner Time Underground.

aniline dyes and other finished chemicals is not carried out on the spot; the majority of the products are shipped to the chemical works in the raw state and constitute a valuable source of revenue.

Economy of transport has received much attention and canals are more extensively employed in this district than in any other part of the world. The network of waterways connects with all the principal industrial centers of Belgium and France. Many of these are covered with strings of barges towed by electric trolley motors, which are said to be economical and satisfactory. The loading of these barges is accomplished with remarkable rapidity by methods which compare favorably with those of Barry docks and other European coal centers.

This coal basin is full of interest alike to the miner and to the geologist, for it possesses many peculiarities. The thickness of the seams which are now being extracted varies from less than half a meter to about a meter and a quarter, though it is not uncommon to find considerable masses of coal where extensive folding occurs in the seams. The high inclination and its variation make it necessary to adopt special methods to suit conditions, and some of these are very ingenious. The tiny mine-cars, sometimes built aslant to suit the inclination of the seam, and the forests of slender poles used to support these narrow excavations, are unlike those seen in any other district. The accompanying photographs will illustrate.

The geology, too, is interesting, and presented some surprises to early investigators, for the coal seams peculiar to the Carboniferous rocks were found to occur under strata of Devonian age. This apparent anomaly has, however, been satisfactorily explained by recent developments, and it can clearly be seen that the super-position of the older Devonian rocks is due to a great fold in the formation.

The tardy development of this great coal basin, for it is still in its infancy, is largely due to the fact that the seams are overlain by a considerable thickness of calcareous marls, which have not only concealed the treasures beneath it, but have rendered their exploitation a matter of difficulty and expense.

Safety Chain at the Top of an Incline.

These barren measures carry enormous quantities of water and quicksand, in consequence of which special methods have to be adopted in sinking. The practice of freezing the ground with ammonia, by means of a number of holes around the site of the shaft, is generally selected and is successful, as the thickness of these water-bearing beds is not excessive.

To every miner, and especially to those acquainted with this locality, the extremely hazardous nature of his calling, and the uncertainty of what he may be pleased to consider satisfactory working conditions, will be deeply impressed on his mind when he reads of the occurrence of such an appalling disaster in one of the most progressive mining districts of Europe; while the engineer will be at an entire loss to understand how an explosion could affect so extensive an area in a mine where a high standard of engineering and organization is maintained.

SOME assayers in Colorado add fluorspar to the flux for Cripple Creek ores. They state that they obtain higher results in that way. The statement is made that fluorspar goes through a smelting furnace unchanged, and certain smelters will not pay for the lime content of fluorspar as 'available lime.' This is, however, erroneous. Fluorspar is a powerful flux, and its addition to the assay charge may possibly lead to higher results because of the production of a better slag.

ERRATUM.—THE article on 'Thorium' appearing on page 145 of our issue of March 3 was taken from the editorial column of the *Mining Journal*, London. Acknowledgment was omitted through an oversight. —EDITOR.

The Grand Central-Mammoth Decision.

(*Continued from Page 160.*)

In determining whether the findings of the court were warranted by the evidence, it is important to consider what constitutes a vein or lode. It will hardly be contended that, merely because rock is broken, crushed, shattered, and even fissured, it constitutes a vein within the meaning of the laws of Congress. All miners of any experience, as well as men of scientific research, know that such occurrences may be found in the most barren country. Something more is necessary to dignify that kind of material with the character of a vein or lode. The material, whatever else may be its condition, must be metalliferous—must contain some kind of mineral of value, so as to distinguish it from the country rock; and especially is this true where there are no well-defined walls.

Fissure veins have many characteristics. They are the fillings of fissures or openings in the country rock; they contain different kinds of material, in some respects corresponding with, in others differing from, the country rock; the most common material being quartz. The fissures have selvages and slickensides, and the gangue material is generally easily distinguished from the country rock.

Fissure veins are simple or banded—some continue in the same direction, others are irregular and change their course—some have a continuity of ore while others are barren in places, and still others are faulted. The appellant, as we have seen from the testimony, claims the vein in dispute is continuous in the same direction; the respondent that it changes its course and is faulted. The books tell us that vein-making fissures have been formed, by contraction on drying, as in an argillaceous stratum, or on cooling from fusion, or from heat attending metamorphism; by subterranean movements, by the disruptive or expansive action of vapors resulting from volcanic action; and by corroding vapors, or by solutions from the deep which sometimes enlarge the fissure, especially where the rock is limestone. Fissures formed through volcanic action, and enlarged by corroding solutions and vapors, are deep-seated and frequently contain large cavities. That the vein in question was so formed by such action and solutions or vapors appears from the testimony, as we have already observed. It will be perceived that to define the word 'vein' that represents a thing of so many and varied characteristics is a matter attended with difficulty, especially is this true if such definition, in view of the statutes which deal with mineral-bearing veins only, is to convey an accurate idea of the thing itself. Mr. Justice Field, in the Eureka case, 4 Sawy. 302, said: "It is difficult to give any definition of the term as understood and used in the acts of Congress, which will not be subject to criticism. A fissure in the earth's crust, an opening in its rocks and strata made by some force of nature, in which the mineral is deposited, would seem to be essential to the definition of a lode, in the judgment of geologists. But to the practical miner the fissure and its walls are only of importance as indicating the boundaries within which he may look for and reasonably expect to find the ore he seeks. A continuous body of mineralized rock lying within any other well-defined boundaries on the earth's surface and under it, would equally constitute in his eyes, a lode. We are of opinion, therefore, that the term as used in the acts of Congress is applicable to any zone or belt of mineralized rock lying within the boundaries clearly separating it from the neighboring rock."

In Iron Silver Mining Co. *vs.* Cheesman, 116 U. S., 529, the Supreme Court of the United States adopted a definition of vein given by Mr. Justice Hallett in the same case, as follows: "To determine whether a lode or vein exists, it is necessary to define those terms; and as to that, it is enough to say that a lode or vein is a body of mineral, or mineral-bearing rock, within defined boundaries in the general mass of the mountain. In this definition the elements are the body of mineral or mineral-bearing rock and the boundaries; with either of these things well established, very slight evidence may be accepted as to the existence of the other. A body of mineral or mineral-bearing rock in the general mass of the mountain, so far as it may continue unbroken and without interruption, may be regarded as a lode, whatever the boundaries may be. In the existence of such body, and to the extent of it, boundaries are implied. On the other hand, with well-defined boundaries very slight evidence of ore within such boundaries will prove the existence of a lode. Such boundaries constitute a fissure, and if in such fissure ore is found, although at considerable intervals and in small quantities, it is called a lode or vein."

In all these definitions, as will be noticed, the essential elements of a vein are mineral or mineral-bearing rock and boundaries, and no doubt that, when one of these elements is well established, "very slight evidence may be accepted as to the existence of the other." It would seem, therefore, that where one claims extra-lateral rights, under the acts of Congress, because of a vein existing and apexing in his ground, but which has no well-defined boundaries, he, when his claim is controverted, must, in order to exercise such rights, show a body of mineral-bearing rock of such value as will distinguish it from the country rock, or from the general mass of the mountain. The material must in texture and value be such as to show the existence of a vein, and the mere fact, as has been stated, or proof of the fact that the rock is broken, shattered and fissured, and mixed with calcareous substance, though it may show a conglomerate mass, does not establish, in the sense of the statutes, a vein. When, however, the walls or boundaries are well-defined, the vein differentiated from the adjacent country, and the kind of material mentioned constitutes the filling, evidence of slight value in mineral will, it seems, be sufficient. It is insisted for the appellant, however, that "a lode, within the meaning of the statute, is whatever the miner can follow with a reasonable expectation of finding ore;" that, though he sees no ore, yet, if he sees gangue and vein-matter, he discovers the lode; and that whatever material would be sufficient to render valid a location thereon would be sufficient evidence of apex to justify one in following therefrom downward, beyond the side-lines of the location, in the same kind of material to, and beneath, the surface of his neighbor's property.

We do not thus interpret the law. What may constitute a sufficient discovery to warrant a location of a claim may be wholly inadequate to justify the locator in claiming or exercising any rights reserved by the statutes. What constitutes a discovery, that will validate a location, is a very different thing from what constitutes an apex to which attaches the statutory right to invade the possession of, and appropriate, the property which is presumed to belong to an adjoining owner. The question of a sufficient discovery of a vein, of the validity of a notice of location, upon which the cases, cited by the appellant on this point, are authority, is substantially different from one relating to the continuity of a vein on its dip from the apex, and which tests the rights of the undisputed owner of the surface to what lies underneath and within his own boundaries.

It is the object and policy of the law to encourage the prospector and miner in their efforts to discover the hidden treasures of the mountains, and, therefore, as between conflicting lode claimants, the law is liberally construed in favor of the senior location, but where one claims what, *prima facie*, belongs to his neighbor, because of an apex in the claimant's location, a more rigid rule of construction against the claimant prevails, and, as we have already observed, he has the burden to show not merely that the vein on its dip may include the orebodies in the adjoining ground, but that, in fact, it does so include them. Until he establishes such fact, beyond reasonable controversy, he has no rights outside his side-lines in another's ground. "In determining what constitutes such a discovery as will satisfy the law and form the basis of a valid mining location, we find, as in the case of the definition of the terms 'lode' or 'vein' that the tendency of the courts is toward marked liberality of construction where a question arises between two miners who have located claims upon the same lode, or within the same surface boundaries, and toward strict rules of interpretation when the miner asserts rights in property which either *prima facie* belongs to some one else or is claimed under laws other than those providing for the disposition of mineral lands, in which latter case the *relative* value of the tract is a matter directly in issue. The reason for this is obvious. In applying a liberal rule to one class of cases and a rigid rule to another, the courts justify their action upon the theory that the object of each section of the Revised Statutes, and the whole policy of the entire law, should not be overlooked."—(1 'Lindley on Mines,' 2nd Ed. Sec. 336). The Supreme Court of Montana, in Fitzgerald *vs.* Clark, 17 Mont. 100, observed: "When it is said that a location may be sustained by the discovery of mineral deposits of such value as to at least justify the exploration of the lode in the expectation of finding ore sufficiently valuable to work, it is a very different question from telling a jury that the geological fact of the continuity of the vein to a certain point may be determined by what a practical miner might do in looking for some hoped-for continuity."

Reverting to the characteristics of a vein, it appearing from the definitions above quoted that its filling must consist of a body of mineral-bearing rock, what value such material should contain is a matter not devoid of difficulty, and no standard of value applicable to all such cases has yet, and probably never will be devised. It must necessarily depend upon the characteristics of the district in which the vein is found, and upon the character, as to boundaries, of the vein itself. If the country rock, or the general mass of the mountain, outside of the limits of the vein, is wholly barren, slight values of the vein material, as before stated, would seem to satisfy the law, but if, on the other hand, the rock of the district generally carries values, then, undoubtedly, the values in the vein material, where the boundaries of the vein are not well, or not at all defined, either on the surface or at depth, should be in excess of those of the country rock; else there can be no line of demarcation, nor, where the rock is generally broken, shattered and fissured, anything to separate it from the adjacent country. Values, therefore, of the filling of a vein must be considered with special reference to the district where the vein is found. It is likewise as to a definition.

In Migeon *vs.* Montana Cent. Ry. Co. 77 Fed. 249, it was said: "The definition of a lode must always have special reference to the formation and peculiar characteristics of the particular district in which the lode or vein is found."

Now, weighing and considering the evidence, which we have already examined, in the light of the foregoing definitions, adopted and announced by the most eminent tribunal in this country, and bearing in mind the characteristics of a vein to which we have adverted, the conclusion seems inevitable that no vein, that will satisfy the demands of the law, has been shown to exist north of the north end of the Cunningham stope, or north of the Silveropolis south end-line extended, within the limits of Lot 38, which from its apex on its dip extends to and includes the orebodies in question.

It is true, the appellant claims the open-cuts and the workings at depth are substantially all in vein material; but, as we have seen,—in the judgment of the appellant's witnesses,—broken, shattered and fissured limestone, or crushed and brecciated matter, no matter how barren, constitutes vein material, although such matter and conditions exist, without any defined boundaries, many hundreds of feet to the east and west of Lot 38, in fact, throughout that limestone area, so far as it was examined by witnesses, and with no more mineralization than is contained in the general mass of the mountain for more than a thousand feet to the east and west, or through the limestone belt. Is it not difficult to perceive how such material, in the absence of both a hanging and foot-wall, can be regarded as a vein? Are not the essential characteristics of a vein absolutely wanting? In the absence of the very elements which constitute a vein, as defined by the highest court of our country, how can we hold a vein exists? There appears to be no mineralization in excess of that contained in the country rock; the existence of no body of mineral or mineral-bearing rock in any opening or fissure established. No witness, save Mr. Akers, attempted to locate the foot-wall of the vein, and he, as we have noticed, at but one place, in judgment only, for his evidence is not direct or satisfactory as to the fact. Several witnesses at a few points attempted to fix the hanging wall, but in each instance the testimony respecting it seems to point to an arbitrary location, for the fracturing, which they claim to be the limits of the vein, extends far to the west of the places pointed to as the hanging wall. We doubt if the most careful scrutiny of an expert could, from the description of the material in evidence, locate what in the judgment of those witnesses is the hanging wall. It seems to exist in opinion only. Nor does the fracturing stop at the Grand Central orebodies. It is shown in evidence to extend, at least as far west as the Grand Central shaft, more than a thousand feet beyond where that wall was attempted to be identified. No court would be justified in holding that, in such a formation as this, the limits of fracturing constitute the limits of the vein. Such a holding would be alike unreasonable and impracticable. It would convert practically all that whole limestone area into a vein—a vein thousands of feet wide, the like of which, we venture to say, no geologist or miner has ever known. Even if there be found an occasional vug or a fragment of ore, yet, where it is disconnected from any orebody and so intermingled with and surrounded by country rock that it cannot be regarded as continuous, it does not mark the line of a vein or lode, within the meaning of the law.

Upon very careful scrutiny of the evidence, we are of the opinion that the court did not err in rejecting the theory that the limits of fracturing constituted the limits of the vein, nor in holding that the vein, existing in the south end of Lot 38, did not continue in that lot north of the north end of the Cunningham stope. Where then, and in what direction, does the vein proceed on its strike from that stope, and where are its boundaries or limits? That the Mammoth vein was formed by replacement—by replacing the limestone, molecule for molecule, with mineral through the thermal and chemical waters, or corroding of vapors or solutions, ascending from the deep through the fissure or series of fissures constituting the lode, and that, where the ore appears, the fissure or opening was widened and large cavities created and filled with ore, through metasomatic action—appears manifest from the evidence. The acid and corrosive solutions acting upon the limestone corroded it or dissolved it, and the limestone thus precipitated the ore, by depositing it out of the solution. Thus, evidently, the orebodies were built up particle by particle by dissolving the limestone and precipitating the ore, or by replacing the limestone with ore. It appears in evidence that great masses of ore are found in which the original bedding planes can yet be traced, these planes not having been obliterated by the metasomatic change. It also appears in evidence, as has been observed, that, in running from an orebody into limestone anywhere, barren rock will be encountered within a few inches or a few feet of the ore. In other words, the limit of the ore everywhere is practically barren rock or barren material. This clearly appears from the testimony of Col. Wall and Mr. Loose. According to the decided weight of the evidence, the mineralization practically ceases everywhere within a short distance from the orebodies. The direction of the ore-channel and orebodies will readily be observed from the diagrams. It will be noticed that the ore-

channel, although irregular and changing its course at the Cunningham stope and at the Bradley-Consort line, is continuous clear through from the Mammoth shaft to north of the Butterfly stope, a distance of more than 2,000 feet.

Reverting to the geological features, we will first notice the dip of the vein and back fissure, and here the appellant in its contention encounters a serious obstacle, for, in vain will the record be searched for a degree of inclination that would carry a vein from Lot 38 to the orebodies in dispute. The vein and orebodies, wherever explored, occupy almost a vertical position. As we have shown by a review of the evidence, at the Mammoth shaft, the vein and ore go to the deep so nearly vertical that on the 1,900 level, a distance of 1,800 ft., the westing is but 100 ft., and the dip over 86° from the horizontal. The dip of the back fissure is shown to be about the same, from the Finn tunnel to the 800 level, a distance of 688 ft., the Finn tunnel being 92 ft., and the 800 level 135 west of the west side-line of Lot 38, making a westing of but 43 ft., and a dip of 86½°. So, we have seen, that, on the Grand Central side, from top of the winze on the 400 down to the 1,000 level, the dip is 82°, and that along the line U–T, where the orebodies in dispute occur, the dip is 75 to 80°. Now, considering the dip of the veins, as thus shown in both mines, in connection with the long distances, apparent from the surface maps, intervening between the west side-line of Lot 38 and the orebodies and vein on the Grand Central side, is it not clear without further demonstration that no dip is shown that could carry a vein from Lot 38 to the controverted orebodies and vein in the Grand Central mine? Such certainly seems to be the fact under proof.

It will be observed that the only place, where ore, in any considerable quantity, and unmistakable vein matter are found in connection with the dikes, is in the immediate vicinity of the ore-channel where it passes through them. Yet, if the appellant's theory that the vein passes through the Finn dike on its dip were well founded, we would expect to find evidences of it passing through it at other points along its strike.

It seems perfectly intelligible that when the mineral-bearing solutions, ascended from the deep and circulated through the main fissure or series of fissures, they were, by pressure or other of nature's processes, forced through the crushed and shattered rock and loose brecciated material, and that by the metasomatic action of the solutions, the mineral was deposited as far as the rock or material was thus physically prepared for the passage of those solutions. The evidence shows that the rock, at the junction of the dikes and where the vein passed through them, was so prepared, and this accounts for the strong mineralization in that vicinity, and for large orebodies, in places, like those of the Betsy and Klondike stopes, leading out from the main fissure or ore-channel.

We concur with witnesses in the criticism that the word 'dike' applied either to the Finn or Coates occurrence is not an appropriate term. It is an inappropriate name applied to what might, with propriety, be termed a faulting fracture. Those occurrences are not intrusions of igneous rocks or matter between sedimentary beds, characteristic of dikes, but, according to the testimony the fractures are filled with minute angular fragments of sedimentary bedrock — limestone and clay — brecciated material, in places, re-cemented with calcite. The term 'dike,' however, having been employed in the record and briefs, has been retained herein for convenience in referring to either of the fractures.

In places the particles composing the filling of the fractures are re-cemented, and in others the material is crushed and loose, especially so at, and in the vicinity of, the junction, and where the vein penetrates the breaks. Except where the ore-channel passes through them, the dikes are not mineralized. That they were originally formed—pre-mineral—and that there has been a faulting of the country along the Finn break, witnesses on both sides appear to agree. They also agree that there were subsequent movements which resulted in further crushing and grinding of the material of the dike, and in either raising the foot-wall country, along the course of the break, or dropping the hanging-wall country. There is a disagreement among the witnesses, however, as to whether the faulting occurred anterior or subsequent to the formation of the vein and orebodies. In the opinion of the witnesses for the respondent, the faulting occurred subsequent to the deposition of the mineral, and resulted in a dislocation and dropping of the orebodies, on the west side of the Finn dike, to a position, down anywhere to 400 ft., below that occupied before the faulting took place. There are indications disclosed by the testimony, however, that strongly tend to show that the throw, or possibly a succession of throws, were down and not up. Such are the indications where Mr. Tyler says ore, slight in quantity, was found in broken and shattered material, and had the appearance of having been dragged down from the orebodies above. Dr. Talmage says low-grade ore occurred at that station on the surface of fractured pieces of limestone, and that there is evidence of movement producing typical slickensides.

There is also testimony showing that, where the vein went through the dike, the ore was crushed, loose, oxidized and rarely re-cemented. Evidently the dike grew wider, and its material became more crushed and powdered, with each successive movement of the mountain masses along the original line of fracture, and the conditions shown by the evidence to exist fairly indicate, not only that faulting occurred along the line of break, since the deposition of mineral, but that the hanging-wall side, including the orebodies west of the dike, was successively dropped, thereby changing the relative elevations of the orebodies existing east and west of the dikes. The difference in the elevations of the orebodies would, likewise, be accounted for if the foot-wall country was raised, and the hanging-wall country not depressed. The importance of this most significant geological feature is thus apparent, for if the difference in the elevation of the orebodies be accounted for, by a depression of the hanging-wall or raising of the foot-wall country, and we think the conclusion, that one or the other of these throws occurred, is but a logical and reasonable deduction from the indications in evidence, then it is too clear for argument that no dip of a vein has been shown which could possibly extend from an apex in Mammoth ground, north of the Silveropolis south end-line extended, and intercept the orebodies in dispute.

Thus, upon careful review of the testimony and upon deliberate consideration of the main geological features, it seems clear that this great ore-channel was formed by the mineral solutions from the deep coursing through a fissure or series of fissures deflected from a northerly course at the Cunningham stope to a northwesterly course, and then again, near the Bradley-Consort line, to a more northerly course; that the channel and deposition of ore along its entire length resulted from the same processes of nature; that the vein passed through the dikes on its strike and was faulted; and that the orebodies in controversy are on its strike and not on its dip, and belong to the owners of the Silveropolis and Consort mining claims. It follows inevitably that the findings of the court were but proper deductions from the proof and being sustained by the great weight of the evidence, respecting both the surface and the underground workings, this judgment must be affirmed, unless there was an error in the refusal to permit the filing of the proposed amendment to the counter-claim, and the proposed original counter-claim, in each of which it was alleged that the vein departed from Lot 38 as found by the court, but that it passed into and continued at its apex and on its strike in the Golden King and Bradley mining claims. [This issue the court proceeds to decide in the negative.—EDITOR.]

Such seems to be the case at bar. The appellant, having founded its claim to the orebodies in its neighbor's ground, upon reserved or extra-lateral rights, has received no injury by its failure to establish a vein in its own ground which would warrant a recovery, and, therefore, cannot complain of the judgment against it, for it still owns all of its possessions. By this decree the appellant had been deprived of none of its property, although, if it has been successful, it would have acquired an immense fortune in its neighbor's land.

Union Shaft, Virginia City.

PROPERTIES OF PLATINUM.—Pure platinum is a silvery white metal with a specific gravity of 21.5. It is the heaviest metal occurring in nature, with the exception of iridosmine. It is almost as hard as iron and very malleable. Platinum does not amalgamate with quicksilver, is not dissolved by potassium cyanide when cold, and is not attacked by acids, except the mixture of nitric acid and hydrochloric acid, known as aqua regia. It is more difficult to melt than gold. Native platinum has been found most frequently in gold-bearing sands. On account of its weight it remains in the sluices with gold and other heavy material. Platinum is most readily distinguished as follows: (1) By its great weight —in panning it remains behind even gold in the pan; (2) its white color —it is whiter than lead and is distinguished from amalgam by its smooth surface, whereas the surface of amalgam, as seen under a good glass, is rough; (3) its resistance to nitric acid, as compared with native silver or lead. Native platinum is usually very impure; occasionally it contains so much iron chromite and other impurities as to be dark in color and not easily distinguished from grains of chromite with which it is frequently associated. It often contains iridosmine, which occurs as flat angular scales, while platinum grains are usually rounded like gold dust. Generally platinum grains are smaller than gold grains.—*U. S. Geological Survey.*

BLUESTONE (copper sulphate) is recovered in electrolytic copper process from the electrolyte by first boiling the solution in lead-lined tanks with cement copper, in the presence of steam and air, for the purpose of neutralizing any free acid present and to increase the percentage of copper present to the amount desired. It is then conveyed to the tanks, where the copper sulphate crystallizes out on strips of lead suspended in the saturated solution. The liquor remaining contains the greater part of the antimony and arsenic which may have been present in the electrolyte and a small amount of copper. The latter is recovered later in other tanks by precipitation on sheets of iron. The copper precipitates in these tanks first, and later the arsenic is thrown down. In some works the mother liquor remaining after recovery of the greater part of the bluestone is concentrated by evaporation, to crystallize out the remainder of the copper sulphate and the arsenious acid. The bluestone is then leached out with an amount of water just sufficient to dissolve it without dissolving the arsenious acid, or iron sulphate. These latter are recovered from the liquor remaining after the last of the copper sulphate has been secured.

THE retail prices of the higher grades of pure white and blue diamonds from the South African mines were again advanced 5% in London recently. Altogether there have been advances in the rough goods aggregating about 60% in four years, but some grades of stones have been put up even higher. The average value of the rough diamonds imported at New York last year was $37.50 a carat. The explanation of the advance given by the London diamond merchants is that there is a scarcity of the qualities of stones that are most in demand, and mining expenses are greater than formerly. This is not a fact, however. For several years there has been a steady fall in the cost of production. A better explanation of the continual advances in prices appears to be that the De Beers and Premier companies are working in harmony.

Modernizing the Comstock Lode.

Written for the MINING AND SCIENTIFIC PRESS by LEON M. HALL.

After many vicissitudes and years of patient toil, the plans for modernizing the Comstock Lode are assuming a definite shape and the end of all dead work is now in sight. Just how well these plans have matured cannot be better illustrated than by a brief description of the new Union shaft works and a comparison with the old.

The Union Shaft Company was a combination (of the Sierra Nevada, Union Consolidated and Mexican Mining Companies) for sinking and equipping what was formerly the North Consolidated Virginia shaft, in order to exploit a large consolidated area from a central opening. This shaft was one of the pet schemes of John W. Mackay and James G. Fair; here they erected and equipped what was at that time the finest and largest mining plant in the world.

The shaft was sunk to a depth of 2,750 ft. and about $2,500,000 was extracted therefrom. The main hoist consisted of a double direct-acting engine with 30 by 96-in. cylinders. The reels when full were about 16 ft. diam. and held 3,000 ft. of 8-in. flat rope. The pump-hoist consisted of a double 18 by 24-in. engine geared five to one, and this was used to handle the heavy pumping machinery. The pump was of the Cornish pattern and consisted of a double line of 18 by 120-in. plungers. These were operated by means of an Oregon pine pump-rod 20 in. square and 2,700 ft. long. The engine was compound-condensing, with cylinders 64 by 78 in. and 100 by 99 in. The flywheel was 36 ft. 1 in. diam. and weighed 115 tons. The steam plant consisted of 12 return-tube boilers 54 in. by 16 ft., arranged for burning wood. The consumption of fuel at the shaft was 60 cords per day, at an average cost of $11 per cord.

This shaft and machinery were operated until the mines became flooded in 1885; since that time operations have been carried on in a desultory manner until about a year and one-half ago, when the works were, unfortunately, consumed by fire. At the time of the fire, an effort was being made to repair the shaft and re-open the lower levels; this improvement was almost entirely lost at the time of the fire, inasmuch as the shaft was burned and caved to the 900-ft. level. It may be mentioned to the credit of the Union shaft management that this property has been entirely rehabilitated and put into first-class, modern condition without exceeding their regular monthly allowance.

The new works, as shown by the accompanying photographs, are arranged in the form of a cross and consist of three separate corrugated iron buildings and a steel head-frame of pleasing and economical design. The engine house is 36 by 62 by 20 ft. and contains, besides the 100-h.p. electric hoist, a 75-h.p. two-stage Ingersoll-Sergeant air compressor and all transformers, switches and meters. The electric hoist is of the balanced tail-rope type, with an auxiliary sinking-drum. It is speeded to 1,000 ft. per min. with single-deck cages, and has a capacity of about 500 tons per day from a depth of 2,000 ft. This hoist is in successful operation and I do not hesitate to say that in so far as speed, control, reliability and efficiency are concerned it is the most perfect mechanism of the kind I have ever seen. Accurate tests show an efficiency of over 72%, and when hoisting rock the brake is seldom used. The motor is a special 100-h.p., 460-volt General Electric variable-speed motor, operating at 450 rev. per min. The air compressor, a class J C, Ingersoll-Sergeant, 19¼ by 12 by 12 in., is driven by a 75-h.p., 2,000-volt, type C, Westinghouse motor, and is connected to the compressor by means of a Morse chain-drive. Three 40-kw., type H, General Electric transformers are used to transform the current from 2,240 to 460 volts for the hoist and for the other surface motors. These are placed at the west end of the engine-house, together with all meters and switchboards.

The carpenter shop, south of the shaft, is of corrugated iron and is 36 by 72 by 20 ft. This building contains the mine office and changing rooms. The carpenter shop is equipped with a 46-inch swing-saw driven by a 20-h.p. General Electric, type K, 440-volt motor. All mine-timbers are framed with this saw, so that carpenter help is reduced to a minimum. The blacksmith shop is directly north of the carpenter shop; it is of corrugated iron and is 26 by 40 by 14 ft. This shop is equipped with one forge, a 2-h.p. motor and American blower, besides a hand drill-press and bolt-cutter. All of these buildings are lighted by electricity and all wiring between them is carried in underground conduits. The steel head-frame was manufactured by the Wellman-Seaver-Morgan Company, and is of unusually pleasing design. This frame is 69 ft. high and is carried upon a 30 in. box girder 42 ft. long, the ends of it resting upon masonry walls on each side of the shaft. The struts are bolted to concrete foundations. The frame has withstood an 80-mile gale and snowstorm and vibrates very little under load. The shaft has been entirely re-timbered from the surface to the 900-ft. level, at which point the fire stopped. Below this point the shaft has been cleaned and repaired to the 2,050. We have, during the past month, opened a station on the 2,000-ft. level and have started a crosscut to intersect the vein now being opened on the 2,150 of the Consolidated Virginia and Ophir mines. This ore-body has already produced about $2,000,000 and as much more is likely to be extracted therefrom. A 4-in. compressed-air pipe extends from the surface to the 2,000-ft. level and a No. 4-3 conductor, 2,500 volt, steel-armored cable is used to transmit light and power to the underground workings. A metallic telephone circuit connects each building and the carman's station with all points in the shaft. A one-inch cold-water pipe extends from the 1,600-ft. level, the water to be used for drilling purposes. Three-inch Sergeant auxiliary-valve drills are used underground.

The plans for the entire plant were prepared by the writer and the works were erected under the superintendence of Mr. A. J. McDonnell.

Head-Frame at Union Shaft.

PURE NICKEL AND COBALT containing not more than 0.05% of iron and metallic impurities have the following physical properties when the metals are fused: Specific gravity at 15° C. (water at 4° C. = 1), cobalt = 8.8, nickel = 8.8. Hardness (Mohr's scale), cobalt = 5.5, nickel = 3 5. Melting point, cobalt = 1,530° C., nickel 1,470° C. Specific heat 20°–100° C. (water at 15° C. = 1), cobalt = 0.104, nickel = 0.108. Electric resistance at 0° C. (in Microhms-cm), cobalt = 5.5, nickel = 6.4. Coefficient of expansion 0°–20° C., cobalt = 0.0055, nickel = 0.0061. Breaking stress (kilo. per sq. mm.), cobalt = 50, nickel = 42.

Handling Ore in the Stopes.

By D. T. WILLIAMS.

The want of an efficient means of handling ore in the stopes is felt in all the mines on the Rand with the exception, perhaps, of the Randfontein group and the upper levels of the outcrop mines, which appear to have been favored by a kind Providence. The angle of dip at Randfontein averages about 60°, consequently no difficulty is experienced in moving ore from the stopes, and the only labor necessary is that required to clear the rock from the working faces to enable drilling operations to be resumed. Owing to this extreme angle the rock falls by gravity to the boxes or chutes at the foot of the stope, and the cost, therefore, is practically nil. But between this angle and, say, 10°, as it is in many mines, there is a wide range, and the relation between angle of dip and the cost of handling the ore becomes apparent at once.

The average cost of conveying rock from the working faces to the boxes at the foot of the stope is about 1s. 6d. per ton, and, should some device be introduced capable of, say, reducing this by 6d. per ton, it would represent a monthly saving of approximately £4 per stamp, an amount well worthy of attention.

The average angle of dip along the Reef varies between 10° and 40°, and it is in these mines where the greatest saving will be effected by efficient handling of the ore, especially in the flatter stopes, where the labor involved by shoveling is fully realized.

In designing an ore conveyor the following features are absolutely essential to ensure any degree of success, namely: Strength and durability; lightness of construction to facilitate handling; ease and rapidity with which it may be erected and dismantled; absence of loose parts, such as bolts, pins, etc., and minimum working parts.

Several devices containing some of these features have been introduced; the following are the best known:

Shaking chutes suspended from roof; stationary chutes; trucks operated in balance; trucks operated by winch; Henderson-Tucker aerial rope-gears; Tuchtan's shaking chute supported from ground; and the mono-rail.

Shaking or Swinging Chutes.—These have met with greater favor than any other form of mechanical conveyor yet introduced. A large number of the mines on the Rand have been equipped with these conveyors.

The shaking chute certainly possesses the essential feature of all successful ore-conveyors, namely, simplicity of construction and freedom from working parts, as it consists merely of a length of plate bent in the form of a trough and suspended from the hanging wall by chain slings. The chute is made up in sections, each about 15 ft. long; these may be removed readily from the stope to prevent injury during blasting operations, and are as readily re-erected.

The chief disadvantage of this ore conveyor is the difficulty of getting the holes drilled in line and properly spaced. When the hanging wall presents an irregular contour, some difficulty is experienced in getting the holes properly pitched, with the result that the suspension chains tend to pull against each other instead of producing a harmonious swinging motion. This difficulty is much more marked in narrow stopes, where the chains are comparatively short and where a few inches difference in the hanging-bolt centers seriously affects the swinging motion of the chutes. Another disadvantage is that each time it becomes necessary to remove the chute to another position in the stope, fresh holes have to be drilled in the hanging wall, and in many cases new hooks must be supplied.

Stationary Chute.—Between the angle of repose and that at which the ore will freely run by the aid of shoveling, stationary chutes are perhaps unequalled, but unfortunately it is here, and here only, they can meet with any favor. These chutes are similar to the shaking chute, with the exception, of course, that no chains are necessary, being merely laid upon the foot-wall. In stopes having a dip of about 30° and upward, the ore will not stick, provided it is handled perfectly dry and the chute free

from any wet fine, which materially affects the coefficient of friction.

The chutes are made in 10-ft. sections, and ⅛ in. thick, so that they may be conveniently handled, and each section is lapped over the lengths in advance and held by bolts passing through both chutes.

This kind of chute is efficient in stopes where the angle of dip is such that shaking chutes are unnecessary, and possesses the advantage of being the cheapest and simplest form yet introduced. Another decided advantage is the fact that these chutes need not be removed while blasting, as they can be protected from injury by merely piling up ore on either side, which of course may be allowed to remain until it becomes necessary to remove the chute to another part of the stope. The only disadvantage that may be placed against this system is its unsuitability for stopes having a dip of less than 30° or more than 40°, consequently it is available only within very narrow margin.

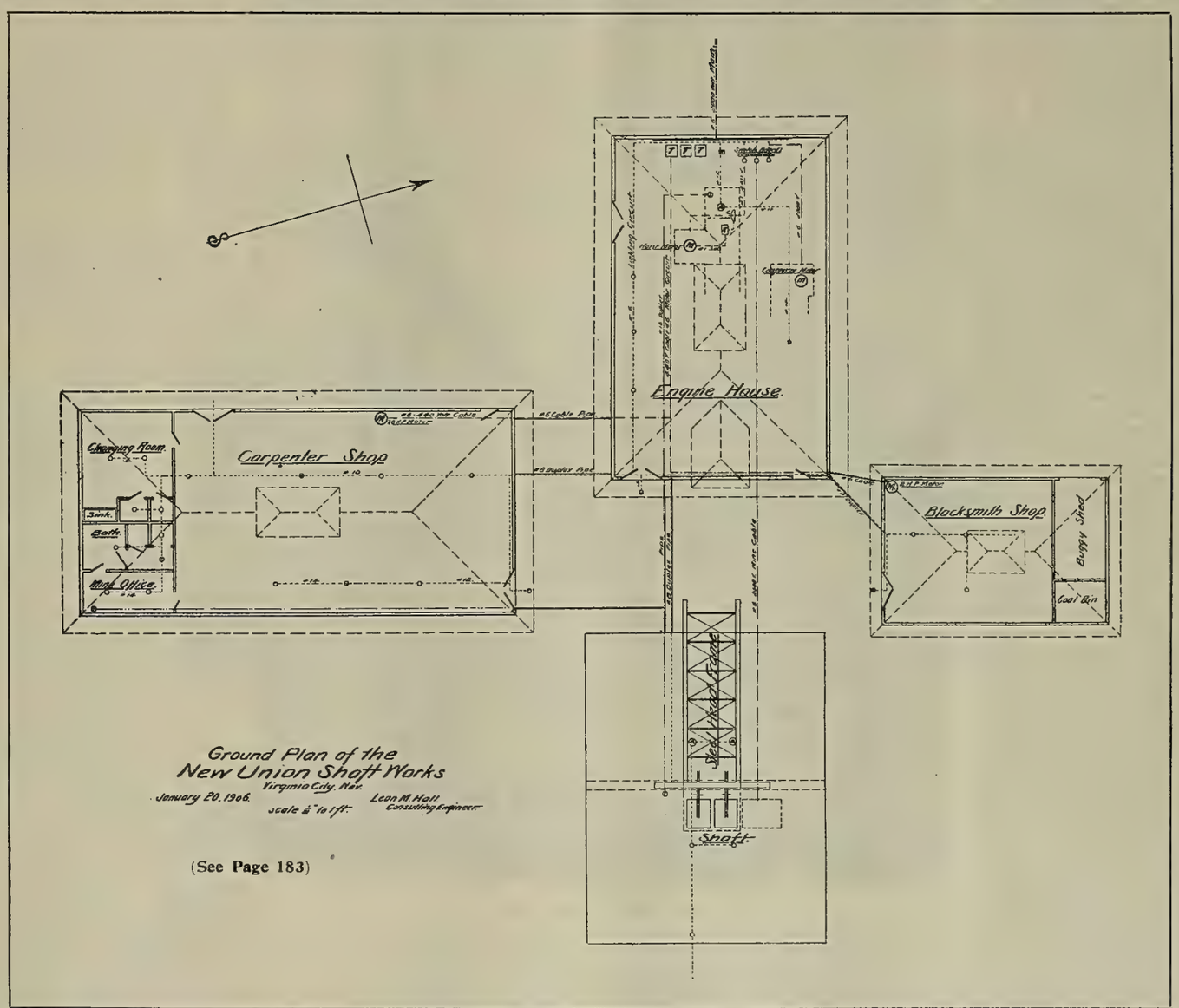
Truck Haulage.—This system has been tested on

The Henderson-Tucker Conveyor.—This is constructed upon the aerial-rope principle, and from the results obtained seems to have amply justified its introduction. The details of this gear are designed to meet the requirements of work in the stopes. The skip is carried upon a wire rope strained between two points, one of which is fixed over the stope-chute, the other being secured to an ordinary machine bar, which may be moved to any portion of the stope as required.

The loaded skip descends the stope by gravity and is hauled back to the loading point by means of a small winch clamped to the bar, and which may be operated by means of an air or electric motor or by hand-power. When the skip arrives at the loading point, it is held by means of a brake on the winch. On the completion of loading, the pressure on the brake is reduced and the skip allowed to descend at the highest possible speed consistent with safety.

This gear is suitable for stopes of any length and is equally efficient in long stopes as in short. When the adjoining section and is supported in the same way.

To compensate for irregularities in the foot-wall, adjustable lugs are fitted to the frame, so that no difficulty is experienced in securing perfect alignment. The U-hanger of the top section is fitted with a lever arm which is depressed by a boy; this provides the necessary swinging motion. In the top section there is a spring bumper which gives a sudden jerk to the chute and considerably increases its efficiency, especially in flat stopes; in fact this conveyor works with surprising results on perfectly level ground, and has practically settled the question for flat stopes. The whole gear has been most carefully and ingeniously designed, and all bolts, pins and working parts producing friction, carefully avoided. A distinguishing feature of the conveyor is its adaptability for working in narrow stopes, as it does not stand when erected complete more than 18 in. above ground-level, and with the exception of the stationary chute, would be capable of working in much narrower stopes than any gear yet introduced, in addition to the fact that



(See Page 183)

several mines with varying success, depending upon the conditions. The trucks used for this purpose are generally constructed somewhat shallower than the ordinary cocopan, but otherwise they are similar in design and of the same gauge.

The chief disadvantage of this system is that it is not practical in stopes of, say, less than 4 ft. 6 in. width, this being due to the fact that fully 18 in. is necessary above the top of the truck for loading purposes. The trucks are run upon ordinary rails of 12 to 14 lb. section, and are either operated by means of a winch at the top or foot of the stope, or run in balance with a brake-wheel at the top of the stope, the loaded car descending, and of course hauling the light car to the top for loading.

With the truck system, whether it be operated by a winch or run in balance, the chief advantage lies in the fact that no chutes are necessary at the foot of the stope, as the cars are run into the level either upon flat sheets or turntables, unhitched and taken to the main bins, where they are relieved of their contents and returned to the stope. Another advantage worthy of mention is that no time is occupied in erecting or dismantling the gear, as the cars are simply run out of the stope, and the rails suffer little or no damage if left in the stope during blasting operations.

span of the rope, however, exceeds, say, 100 ft., it becomes necessary to support the rope to prevent excessive sag. This is accomplished by means of jumper arms clamped to an ordinary machine bar. The tipping is accomplished automatically by means of a lug riveted on to the skip-body, and which comes in contact with a piece of piping arranged diagonally to the rope at the required dumping place. The necessary tension is given the rope by means of tighteners, one end of which is secured to the bar and the other to the rope. This gear may be dismantled in about 15 to 20 min., and erected in about 30 min., irrespective of the length of the stopes. Another advantage is the ease with which it may be moved from any one point in the stope to another; this operation only occupies, say, 10 to 15 minutes.

Tuchtan's Shaking Chute.—This is constructed substantially upon the principle of the swinging chute, but, instead of being suspended from the hanging wall, is supported in a frame made of a slight section of angle iron. It is made in lengths of 8 ft., and any one section can be easily handled by two boys. The chute is supported at the top end of each frame by means of a U-shaped hanger. The hanger is constructed of about ⅜-in. round iron, and the chute is fitted with two lugs which fit over this and form a bearing, the other end of the chute overlaps the it operates with efficiency in extremely flat stopes, and where the stationary chute would be useless. Another feature worthy of note is the ease with which it may be moved from any one position to another, as no holes have to be drilled for its support in the hanging wall. Unfortunately, no figures showing the saving effected by its use are obtainable, but during a trial it was proved that one boy was capable of doing ordinarily the work of six.

Cost.—The relation between the length of stopes and cost of handling ore is closely related, and forms a subject of considerable interest, although complex in nature. It is perfectly obvious to all that the cost of shoveling over a distance of, say, 220 ft., must be considerably higher than shoveling the same amount of ore over a distance of, say, 100 ft., presuming, of course, the angle of dip in each case to be the same.

At the Village Main Reef, with an average angle of dip of 29°, the stopes are only 150 ft. in length, whereas the Glen Deep, with an average angle of dip of 29°, are 230 ft. long. The comparison of cost is also marked, as the cost of conveying the ore from the working faces to the boxes on the Village Main Reef is only 1s. 2.75d. per ton, whereas the cost on the Glen Deep, with its 230-ft. stopes, is 1s. 6.45.*

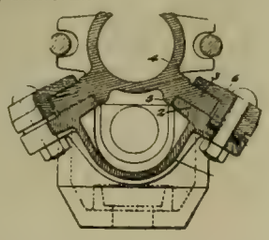
*From a paper read before the South African Association of Engineers.

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 27, 1906.

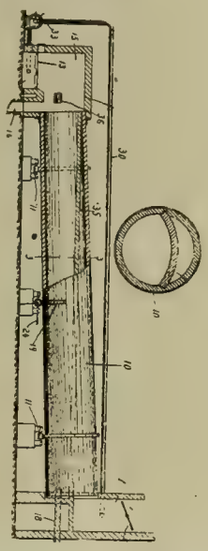
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ROCK-DRILL.—No. 813,041; D. C. Demarest, Angels Camp, California.



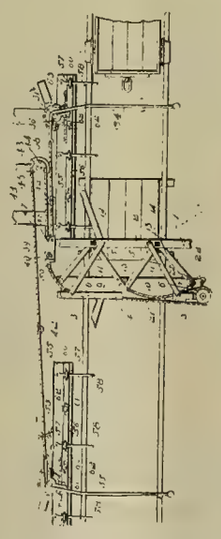
In rock-drilling machine combination of shell and cylinder supported thereon one of parts having lugs and the other part having seats for lugs, and means to clamp the cylinder to the shell, means including bolts passing through the caps and shell, shell having counterbores and caps having bosses fitting said counterbores.

OSCILLATING CEMENT-KILN.—No. 812,834; B. E. Eldred, Bronxville, New York.



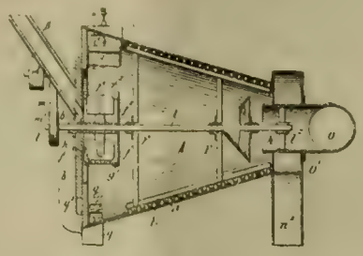
A cement-kiln having inclined barrel provided with flame-producing means at its lower end, and at its higher end a stack and material-supplying means, barrel having refractory interior walls forming combustion-chamber of flattened internal cross-section tapering from larger vertical diameter at lower end to a smaller vertical diameter at the stack end, and means for automatically rocking kiln.

MINE-SHAFT DOOR.—No. 813,067; I. Whitney, Oskaloosa, Iowa.



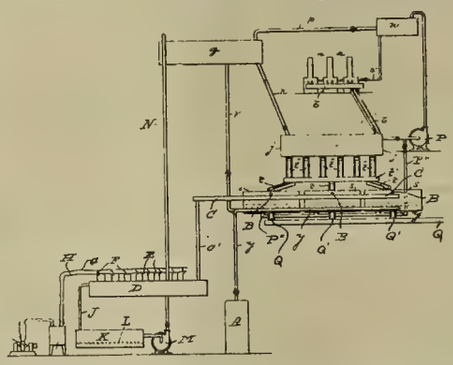
The combination with door, of a plurality of door-operating devices extending across pathway or road leading to the door, and in a position to be successively engaged by an animal or object traveling over track, each of door-operating devices serving when operated to effect complete opening movement of the door, and all acting as they are successively engaged to retain the door in full-open position.

SEPARATING-MACHINE.—No. 812,972; H. Baldwin, Youngstown, Ohio.



In machine for separating mixture of solid particles of different size or weight, combination of an imperforate tapering separating-chamber having near its small end an outlet for light or fine articles and near its large end an outlet for the heavy or coarse particles, circulating-fan arranged outside chamber and having its blast-orifice arranged to deliver the air-current into chamber near the large end and produce a whirling air-current therein, means for conducting the air-current from the interior of separating-chamber to circulating-fan, a fan for feeding material to be separated into air-current delivered into separating-chamber by circulating-fan, the case of feeding fan having peripheral wall by which the feeding-current is confined, and which is provided with a blast-orifice by which feeding-current is directed into current which is delivered by the circulating-fan, and means for feeding material to be separated to feeding-fan.

PROCESS OF EXTRACTING GOLD, SILVER, ETC.—No. 813,620; J. A. Comer, Los Angeles, California.

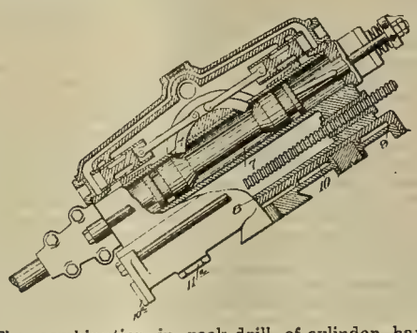


The process of extracting gold, silver, and other metals from ores, consisting in subjecting crushed ores to a solution of cyanide of potassium, drawing off the solution from pulp mixed therewith, impregnating with air the solution and sedimentary deposits suspended therein, separating sedimentary deposits from solution, and depositing metals contained in solution with electricity.

CONTAINER FOR FILTER-PRESSES. — No. 813,014; C. W. Merrill, Lead, South Dakota.

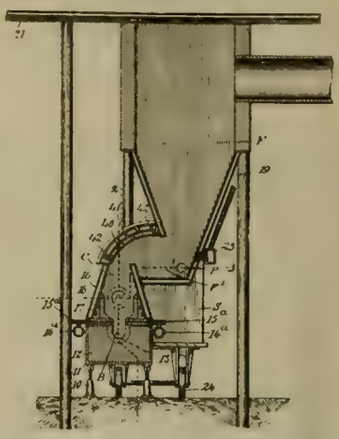
In a filter-press, a container provided with a wedge-shaped element along its inner surface; an inner surface in the form of a keystone, with the large end extending outward into the interior.

ROCK-DRILL.—No. 813,828; E. A. Rix, San Francisco, California.



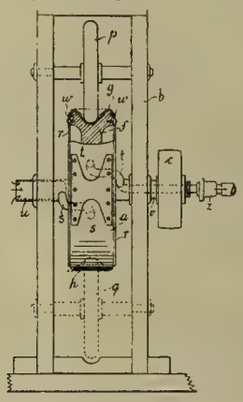
The combination in rock-drill, of cylinder, having slide fixed to and projecting from its bottom, shell within which slide is movable, bottom of slide and bottom of guide being spaced from each other, and means operable in space between bottoms and adjustable in one direction to compensate for wear between bottom and also sides of guide.

SMELTING AND REFINING PROCESS.—813,824; E. C. Pollard, Seattle, Washington.



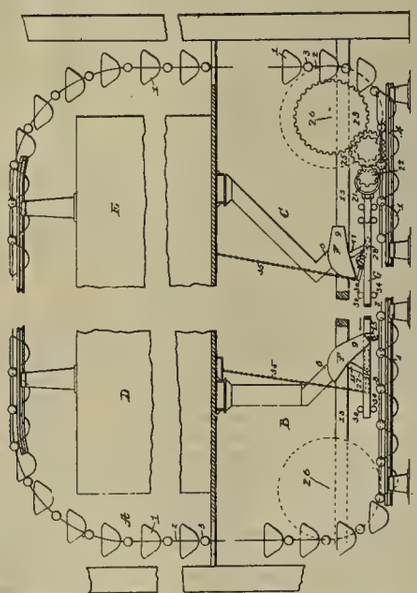
A continuous process of bessemerizing copper mattes, consisting in passing stream of silicious slag over bessemerizing regions, discharging slag into contact with ferrous sulphide to reduce any copper carried by slag to subsulphide, discharging a part of slag, and returning remainder thereof together with ferrous and cuprous sulphides, to bessemerizing regions to supply matte to bessemerizing regions.

COMPRESSOR. — No. 813,443; H. Mikorey, Schoneberg, near Berlin, Germany.



Compressor comprising wheel having groove on periphery, membrane formed of rubber stretched across groove so as to form an annular chamber, means for holding membrane at one point permanently pressed against bottom of chamber, an inlet-pipe entering chamber on one side of means, an outlet-pipe on other side thereof and roller of less thickness than wheel engaging membrane so as to force it against bottom of groove.

CONVEYER CHUTE.—No. 813,473; F. R. Willson, Jr., Worthington, Ohio.



In delivery or feed mechanism, combination of conduit for material having delivery opening, chute adapted to receive material from opening, a longitudinally reciprocating bar to which chute is connected whereby chute may be moved to deliver such received material, and a closing means for opening operated to cut off material from chute when latter is moved to deliver its material.

Mining Summary.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

LONDON, February 28.

A company has just been formed—The Esperanza Copper and Sulphur Co., Ltd.—to exploit a group of mines in the province of Huelva, Spain, covering an area of 655 acres of mineralized ground, with surface rights over 1,900 acres, nearly the whole being purchased outright. The mines are connected with the port of Huelva by a railway 40 miles long. Messrs. Matheson & Son, of Rio Tinto fame, are the commercial agents. The prospectus is based on a report by Robert Addie, of Pringle & Addie. The capital is £350,000 in £1 shares with £100,000 of 5% debentures. Working capital £50,000, sufficient for an equipment to produce 100,000 tons of ore per annum, at which rate the life of the mine is estimated at 12 years at a profit of £70,000 per annum. Purchase price £381,500, payable in £100,000 debentures and the remainder in cash and fully paid shares. Leading copper firms guarantee the subscription of 185,000 shares. There are already developed, partly by mining and partly by open-cast: (1) 372,020 tons rich ore for export direct; (2) 584,337 tons poorer ore for local treatment; (3) 275,633 tons sulphur ore for sale direct. Estimated profit per ton: Class 1, mined, £1 7s 4d, open-cast £1; class 2, mined, 12s 6d, open-cast, 19s 6d. Class 3, mined and open cast, 3d. Total net profit at the mines from ore developed, £908,492, on basis of best selected copper at £63 per ton.

The Bonmahon Copper Mines Development Syndicate, Ltd., capital £30,000 in £1 shares, has been in operation for about three months re-opening the Knockmahon and Tankardstown copper mines in county Wicklow, Ireland. The rights have been acquired free from all royalty and charges. Working capital £12,500. The reports are by J. H. Collins and others. The management is under the direction of A. L. Pearse. The mines are expected to enter a highly remunerative stage within the next six months, and it is hoped that the opening up of these copper deposits will attract capital to Ireland.

It is expected that the new railway, with a port on the Red Sea, will have the result of directing attention to the extensive ancient goldfields of the Sudan (Ethiopia) between the Nile and the Red Sea. So far Egyptian mining in these modern times has not had a brilliant record. In a list of eleven companies operating in those regions of biblical interest, one only—the Egypt and Sudan Mining Co.—stands at a premium on the market. The Nile Valley Co., Ltd., after spending about £90,000, is appealing for more capital under a scheme of reconstruction. According to a shareholder's statement at the general meeting, they have only 'scratched' the ground to a depth of 200 ft. Recurrent rich patches have been found, but the average of the milling has been only 11 dwt. In regard to the aforesaid scheme, the proposed issue of partly paid shares by a new company as consideration for the property, with a liability of 4s. per share for working capital, has been pronounced *ultra vires* in the Court of Chancery. The decision that shareholders cannot be compelled to take up new shares with a liability under penalty of forfeiture and sale of their old shares is an important one, in view of the practice in numerous reconstructions which have taken place among English limited liability companies.

The shares of Torres Mines, Ltd., capital £100,000 in shares of 10s. each, have been introduced on the London market at 10s. 6d. to 11s. The company owns five claims near Parral, in Chihuahua, Mexico; area 28½ acres. The property was reported on by John Taylor & Sons. The lode is said to average 2½ ft. wide, value 33s. per ton without sorting, three-fifths being in gold. A considerable amount of development work. No prospectus published.

The January profit of Esperanza (Mexico) is reported as £63,542 against £86,258 in December. The falling off is attributed to a diminished output owing to shortage of railway cars for shipping ore, which forms the principal source of revenue.

At Camp Bird, the mill crushed in January 6,829 tons which yielded 7,920 oz. bullion, and about 489 tons concentrate. The profit on these returns is not stated. It is explained that the exact amounts realized by each month's production cannot be given within six weeks or two months, and as estimates are unsatisfactory, none are supplied. Instead of these, the total of the cash receipts for the month is shown, from which the working expenses for the same period are deducted, the difference being described as "applicable to profit." The problem as to what is the approximate monthly profit remains for solution on the completion of the accounts at the end of the financial year. There is no report as to the location and features of the developments—aggregating 709 ft.—during the month.

The annual meeting of the Tasmania Gold Mining Co., Ltd., held last week was an interesting function. Of the total capital of £500,000, the sum of £180,000 was originally set aside for working capital. The pumping installations are described as the most extensive and powerful machinery of the kind in the world—capacity 8,000,000 gal. per 24 hours from a depth of 2,000 ft. The plant includes three compound-horizontal pumping engines by Hathorn, Davey & Co., winding engine by Fraser & Chalmers, and numerous Babcock & Wilcox boilers. A new shaft 32 ft. 1 in. by 8 ft. 6 in. in the clear is being sunk to a depth of 1,250 ft.; present depth 900 ft. Ore reserves are put at 131,355 tons, of which 22,355 tons are blocked out. Gold sold during the year £130,442; average value of output £3 per ton, and average working costs £1 17s. 7d. per ton. Net profit £46,712. The former company paid dividends amounting to £750,000 from £2,000,000 worth of gold won at a moderate depth. Present developments include a length in ore of over 1,000 ft. at the 900-ft. level; width averages 6¾ ft. for an average value of nearly 1¾ oz. The lode has also been proved at the 1,000-ft. level for 191 ft. in ore, averaging 7¾ ft. wide and 1½ oz. per ton. The managers are John Taylor & Sons. As a proof of the interest taken in this company locally, it was stated at the meeting that two-thirds of the shareholders were in Australia.

Mt. Bischoff (Tasmania) tin mine has just declared a dividend of 10s., bringing the total of dividends paid to £2,031,000 or £167 5s. per share.

The latest valuation of the ore reserves of the Great Fingall Consolidated (West Australia), made by the general manager, puts the quantity at 753,042 tons of an average value of £2 15s. 6d. per ton.

The recently established Zinc Corporation, Ltd., with a capital of £350,000, has secured from Block 10 Co. Southern Broken Hill, Block 14 and British Broken Hill Proprietary, an aggregate of 1,750,000 tons of tailing, estimated to be worth £10,000,000 in zinc, lead and silver. The result of the mill (first unit) test has just been announced as satisfactory. The assays give 42% zinc, 8% lead and 15 oz. silver.

The New Zealand gold output for 1905 is given as £1,065,382, being an increase of £190,000 over 1904. Of this Waihi is estimated to have contributed £712,066, from which it paid dividends during the year amounting to £325,000. The yield for the last two years averaged £2 6s. per ton. The issued catipal of this famous company is £495,907. The gold taken out of the mine has amounted to £4,000,000. It is reported that the main Martha lode strengthens at depth.

The annual report of the Mysore Gold Mining Co., Ltd. (India), for 1905 is good reading. 195,650 tons were crushed for 184,957 oz. and 20,432 oz. from cyanidation of the tailing. Total value £804,660—a new record. Dividends paid for the year £420,500. Average yield from mill 18 dwt. 20 gr. and from tailing 2 dwt. 11 gr. The lode at the 3,226-ft. level is reported as three feet wide for 2 oz. 3 gr. per ton. Since the commencement of mining in 1884, the total value of gold extracted is £8,308,218, of which over a half has been paid to the shareholders as dividends.

As a striking contrast, the Coromandel Gold Mining Co. of India, Ltd., capital £135,000, has proved a prolonged disappointment. There have been three reconstructions of this company, the assessments totalling 17s. 6d. per share. Altogether £300,000 worth of gold has been won. The small balance of working capital remaining is being expended in searching for a lode supposed to extend from the neighboring Tank Block property at the southern end of the Coromandel mine.

The under-secretary for the colonies has declared that no Chinese contract expires till May, 1907, and that the Government does not propose to cancel the clause in the ordinance allowing coolies to re-engage for three years. He also states that to classify the conditions of Chinese labor in the Transvaal as "slavery" is a "terminological inexactitude." Winston Churchill is now followed by his chief, Lord Elgin, who "deeply regrets" the "tainted with slavery" speech of the Premier. These epithets, having served the electioneering hour, are to be dropped. Out of the hurly-burly of Parliamentary tongue-wagging emerges the Government "intention" not to allow any Asiatic race to enter the Transvaal again save as men free to live and labor in the country as they choose. Under responsible Government it is thought, in some quarters, that the mine owners will not be able to maintain their monopoly of power. The specter of a United South African republic once more threatens to trouble the councils of Downing street. Meantime the 200,000 to 300,000 "rascally shareholders" in South African mining have seen their securities fall in value during the last two months by over £21,000,000. It is said the liquidation is due largely to bankers calling in loans on these shares.

CLIFTON, ARIZ., March 10.

Within the last few weeks a great deal of interest, or rather re-interest, has arisen in gold mining in the Copper Mountain district, more especially in Gold gulch, where years ago many placer claims were worked profitably. A number of owners of promising gold claims in this district have pooled their interests, formed companies and placed stock on the market, which is being taken up by local people. Among these are the Gold Belt Development and Reduction Co. and the Arizona Gold Mining Co. These claims have not been merely scratched over, but have a large amount of work done on them, and are showing bodies of free-milling ore, which, when panned, gives liberal colors. Parties from Clifton and Morenci visit these claims every Sunday, and they seem to think highly of the property.

The farmers of the Gila valley, as well as the mining companies of this district, which operate concentrators, are much interested in the paper on 'Tailings—Its Effect on Irrigated Arable Land,' read by Prof. Forbes, of the University of Arizona, before a gathering of the farmers of the Gila valley recently. Notwithstanding all previous claims to the contrary, Prof. Forbes says that tailings, if properly handled, are beneficial to irrigated land. Mr. Forbes is considered as one of the highest authorities on irrigating waters, and his statements will have some weight, it is to be hoped, in reforming the opinions of the Gila valley farmers and help to down the bugaboo of a lawsuit against the three companies operating concentrators in this district.

Mr. Campbell, of Boston, manager of the Chase Creek Copper Co., was in Clifton recently visiting the mines of that company, and expressed himself as well pleased with the progress being made in the work by Superintendent Campbell. The main tunnel is now in over 1,200 ft., with a depth at the face of about 700 ft., and several veins have been cut. The object of this company is to drive until they reach the Longfellow lode, and, until this is done, they will ship little, if any, ore. But when shipment does commence, it is expected this company will be one of the large producers of the district.

The wagon-road from the Home Copper Co.'s claims to their shipping point on the Morenci Southern Railway, at Morenci, has been completed, and the new machinery is now on the way to be installed. The Home Copper Co. managers are preparing for the development of their property, and, while they do not expect to ship during the present year, the development work now being done will put them in shape to receive returns from the ore on the dumps.

The Detroit Copper Mining Co., of Arizona, at Morenci, has completed their power-line to the Santa Rosa group, at Metcalf, which they have purchased, and the work of installing hoists, ventilator fans, drills, etc., will be commenced at once. With the completion of the railroad, which this company is building from the Morenci Southern Railway at Frisco Pump to connect with the Coronado Railway at the Shannon Copper Co. smelter, the line of transportation will have been completed, and ore will be shipped steadily from the Santa Rosa copper mines for treatment at the Detroit Copper Co.'s smelter at Morenci.

Reports from the Mayflower copper district, adjoining the Copper Mountain district, are encouraging for the development of small holdings in that district. Several of these have been pooled, the owners having formed a syndicate of local capitalists to push development. This method of business seems to be coming into favor all over this district, as holders of copper claims in Gold gulch, Copper Mountain district, three miles from Morenci, have also adopted the same plan.

Concentrator No. 6, the new mill being erected by the Arizona Copper Co. at Morenci, is under way. Most of the steel framework is up, and a large part of the machinery installed. This concentrator is to treat the low-grade ore of the Humboldt and Joy mines, properties of the Arizona Copper Co. With the completion of this mill, Morenci will have three large concentrators in operation. At present the constructing force of this mill consists of 175 men. The work is under the direction of C. D. Clark.

TORONTO, March 10.

Extensive railroad construction is likely to be a prominent factor in promoting the development of mineral deposits, which have remained unexploited owing to the lack of transport. This is especially the case in regard to iron mines, as, owing to the approaching exhaustion of some of the Lake Superior deposits of high-grade ore, manufacturers will have to look to other sources, and ranges which were formerly considered too low grade will come into favor. The Moose Mountains or Hutton Township range, lying 25 miles north of Sudbury, is to be opened up, Mackenzie & Mann, who control the James Bay Railway, now in course of construction, having acquired an interest in it. The James Bay road is being built as a portion of the Northern Railway system, and the charter gives the company power to extend it as far as Hudson Bay. It was intended, however, to make Sudbury the northern terminus for some time, but in order to connect with the iron mines, it will be pushed 25 miles further north. A branch line will also be constructed, from a point near French river to the Georgian Bay, to allow of the shipment of ore by water. The ore is magnetite of a hard, crystalline character, containing a very small percentage of sulphur and no titanium. It varies from lean to high grade, but a considerable proportion carries iron to 58 or 60%. The railroad extensions are to be completed by January 1, 1907, and a large force is being put on at the mine to take out ore in readiness for shipment.

Dr. Haanel, Canadian Superintendent of Mines, who is at Sault Ste. Marie, directing the experiments in electric smelting which are being made by Dr. Herault, the French expert, sent this week a highly satisfactory report to the Department of the Interior. He stated that the demonstration had been successful in showing that magnetite as well as hematite ores could be economically smelted by the electric process and pig iron desulphurized; also that charcoal, and therefore peat, could be successfully substituted for coke. Nickel pig of fine quality had been produced from pyrrhotite. So far 40 tons of pig have been produced. The experiments will continue for about 10 days longer. Dr. Haanel declares that the process admits of immediate commercial application. The enormous importance to Canada of such a result is everywhere conceded, as it would render available great iron ore deposits, the distance of which from fuel supplies prevents their being utilized by present methods of smelting. But while the experiments are being watched with much interest by those concerned in mining and metallurgy, the general opinion among iron and steel manufacturers is that the electric process cannot compete economically with that now in use.

DENVER, March 10.

At the annual meeting of the Animas Power & Water Co., held on the 6th inst., at Colorado Springs, Henry Jameson, of Indianapolis, was elected president. Henry Hine, of Colorado Springs, under whose determined and progressive spirit the present development of the power plant has been accomplished, is retained as general manager. The company has been fully financed and it is not likely that it will again be hampered or its plans further retarded by lack of funds. This enterprise is destined to play an important part in the future development of the San Juan country, reducing, as it will, within the reach of all, the cost of power for mining and its collateral branches, thus making it possible to mine and market low-grade ores not now exploited. The liveliest center of activity in the San Juan country is the locality adjacent to Animas Forks. To that point the Animas Power & Water Co. first constructed its transmission lines.

It is noteworthy that after the lapse of 30 years Animas Forks, then (1876) a wide-awake mining town of 400 or 500 inhabitants, afterward entirely depopulated, should again be revived, and become an active, thriving center, and there is real justification for its existence now. Instead of the Eclipse smelter of 1880, built by James Cherry at the mouth of Grouse gulch, and written down as a costly failure, Animas Forks has the $500,000 concentrating mill of the Gold Prince mines, which will go into commission this season, and several other tributary mills.

The 1,000-ft. Bonanza tunnel, situated west of Animas Forks, is said to have cost from $300 to $400 per foot, under the early methods, but today mining can be done as cheaply as anywhere in the San Juan country; the advent of the power company promises to further reduce the cost of power from one-third to one-half.

The Mountain Queen mine, at the head of California gulch, near Animas Forks, probably the first property in the locality to send ore to a smelter—in the year

1877—was purchased last fall by Cripple Creek people led by Austin T. Holman, manager of the Golden Cycle. A machine-drill plant was installed and development work has been steadily prosecuted.

San Miguel county has been rather slow in recovering from the disarrangement of her industrial conditions, caused by the labor troubles of three or four years ago. However, recent progress has been steady, so that now the county has almost regained lost ground. Lessees at the Smuggler-Union mines have opened up fine bodies of ore in the lower workings. The Liberty Bell is encountering richer ore as development proceeds in greater depth. There are a number of new mills to be erected this season. The Japan mines are under working option and will be operated by lessees pending a deal. The lime contact below the town of Telluride will receive more than usual attention this summer from those who believe it a promising field for exploration.

At Cripple Creek, since securing the Burnside lease of the Laoconing mine, A. E. Carlton and John H. Hobbs have employed a force re-timbering the shaft and making other improvements preliminary to extracting the ore uncovered by Burnside. —— The lessees on the Gold Sovereign mine have opened new and seemingly extensive ore shoots in old ground north of the shaft.

SALT LAKE CITY, March 12.

Stockholders of the Copper Glance mine, in Bingham, have ratified negotiations for sale of the property to parties represented by John W. Burton, of Salt Lake, for $150,000. The property has been under examination during the past ten days.

The Bullion-Beck & Champion Mining Co. have authorized extending the life of the corporation 25 years. The property is in Tintic district.

The property of the Bingham Central Mining Co. has been under examination the past ten days by W. C. Dunham, of Los Angeles, and others, in the interests of prospective buyers of bonds recently authorized by the owners.

The New England Gold & Copper Co., at Bingham, is preparing for a more extensive campaign. Not long ago E. E. Abercrombie of Boston became identified with the company and was chosen vice-president and managing director. It is to be equipped with a compressor and a larger boarding-house. A 40-ton mill has been in operation for over a year, and the proceeds from the sale of concentrate have more than paid operating expenses, leaving the proceeds of ore sales as profit. Henry M. Adkinson, in charge of development the past two years, is general manager. The property is situated in the upper part of the camp adjoining the Boston Consolidated.

Negotiations are pending for merging the Utah Copper and Boston Consolidated mines at Bingham, and a company formed to operate them. The chief officials of the American Smelting & Refining Co. are at Salt Lake, which has acquired control of the Utah Copper. In the party are Daniel Guggenheim, S. R. Guggenheim, John Hays Hammond, Silas W. Eccles, vice-president and traffic manager, and Isaac Untermeyer, who, with D. C. Jackling, general manager of the Utah Copper, representing the interests of the latter corporation, while Samuel Newhouse, Lafayette Hanchett, and Louis S. Cates, manager of the Boston Consolidated, are attending to the interests of the Boston Consolidated and Cactus. The Guggenheim party will inspect the American smelters, at Murray, Utah, also that now under construction at Garfield.

Thomas F. Cole, of Duluth, the big mining operator, spent two days last week at the Silver King mine, at Park City, with Walter Fitch, his representative in this State.

For several weeks the examination of witnesses has been in progress in the smelter-smoke cases. The hearings may continue for several weeks. There is little doubt of a long siege of litigation with farmers and land owners in the vicinity of the smelters on one side, and the smelting companies on the other.

Daniel Guggenheim, president of the American Smelting & Refining Company and American Smelters' Securities Corporation, stated to the writer, on his arrival in Salt Lake, on the 10th inst., that the Securities Corporation had control of the Balaklala copper mine in Shasta county, California, and that the ores from that property would be sent to the smelter to be erected at San Francisco.

The St. Louis-Magnolia Mining Co. has been formed to operate the St. Louis-Magnolia and June Bug groups at Park City. James McGregor, of Salt Lake, is president and manager.

The Western Exploration Co. will open a branch office in Chicago.

At the Cactus properties in Beaver county a steam shovel is employed in stripping the surface which, Manager Hanchett says, is from 20 to 30 ft. deep. It will be three weeks before the shovel will be working on ore.

A total of 132 cars of ore were shipped to the Salt Lake smelters from the Tintic district last week, the shippers being: Ajax, 3; Bullion-Beck, 5; Beack Tunnel, 8; Centennial Eureka, 54; Dragon Iron, 5; Eagle & Blue Bell, 5; Eureka Hill, 6; Gemini, 10; Grand Central, 3; Lower Mammoth, 2; Mammoth, 9; May Day, 2; Ridge & Valley, 5; Scranton, 2; Swansea, 2; South Swansea, 1; Uncle Sam, crude, 3; concentrate, 2; Victoria, 3; Yankee Consolidated, 2.

ALASKA.

J. H. Rogers, traffic manager of the White Pass & Yukon Railway, states that his company has contracted to take in machinery for dredges, steam shovels and railway equipment to Dawson for the Guggenheims of New York.

The Detroit-Canadian-Klondike Co., which operated a dredge in the Yukon district last year, will instal another this year. —— A St. Louis company operating on Bonanza creek will put in a dredge this season. —— It is reported that a Toronto company will operate a dredge at Forty Mile this year.

W. C. Crosby and others, of Boston, have purchased the Dora Ebner and Mount Juneau mines at Juneau, and will take possession of the property April 1. The Hile tunnel will be extended to 3,000 ft., with a raise of 1,800 ft. A long tunnel will be driven on the Dora group. A lower tunnel will be driven from Gold creek to tap the orebodies at a greater depth, and a 100-stamp mill will be put in. It is planned to enlarge the latter later. Power for operating the mill will be generated on Salmon creek. The groups of mines taken over include 38 claims.

The steamer *Leelanaw*, which arrived at Tacoma last week with 1,000 tons of concentrates from the Treadwell mine, Douglas island, will return with a load of coal for the Treadwell plant.

The steamer *Farallon*, which arrived at Tacoma a few days ago with 125 tons of copper from Ellemar mines, near Valdez, will return with 250 tons of coal.

It was reported that P. Monohan and J. Smith have made a strike on the Upper Shushutna, near Seward, taking out 118 oz. gold in two days with a rocker.

E. W. Johnson of Seattle reports a rich strike on one of his Nome claims, the pay-streak running $400 to a pan. The claim is No. 8 on Cooper gulch, and is near the Portland beach property, from which $1,000,000 was taken last year. Captain Johnson believes they are on the same pay-streak. Johnson's Nome manager has taken three boilers which were being used for harbor improvements at Nome for work on the new diggings. Bedrock was struck at a depth of 65 ft. The crew on the property consists of 20 men, and three shifts are being worked.

ARIZONA.

Cochise County.

At the T. C. M. Co. mill, at Tombstone, everything is going satisfactorily. The run on 20 of the stamps since the mill started up has given good results, and has averaged 100 tons daily. It is reported that the remaining 20 stamps will shortly be operated on concentrating ore. At the big shaft the Dow pump has been installed at the 700-ft. level and two sinkers are expected here next week. The pumping record is kept at about 3,000,000 gal. daily, until such time as all pumps will be in commission, when this amount will be increased somewhat and sinking operations resumed. The output from the outlying mines of the company continues about the same, averaging a shipment of two carloads daily to the smelters.

Gila County.

Development work is to be done by the Apache Consolidated Mining Co. at the Basin mines, near Globe. E. F. Pfister, formerly with the Junction Co., at Bisbee, who has been made general manager, will sink a double-compartment shaft several hundred feet.

Maricopa County.

Contractor Mitchell has suspended diamond-drilling at the Harryhousen group, near Phœnix, until needed improvements can be made.

Mohave County.

W. H. Cushing, of the Stockton Hill Mining Co., has taken over the Moonbeam mine, near Kingman, owned by McLean, and the K.P. and P.K. mines, owned by L. Kimerly and J. C. Potts.——A mill is to be erected on the Cupel mine, near Kingman, and the ore is to be dressed for market.——The Cerbat Mountain Mining Co. is considering putting in a mill at the Vanderbilt mine, near Cerbat.——Owing to the volume of water at the Idaho mine, near Cerbat, sinking has been discontinued at the 125 level, and drifts will be run on the orebody.——W. G. Blakley and J. C. Goodwin intend to put a stamp-mill on the railroad near McConnico to test ores from various sections.——Sinking is to be resumed at the Enterprise mine, near Kingman, to the 500-ft. level.——The 10-stamp mill of the Vivian Mining Co., at Vivian, will be opened on March 11.——L. D. Godshall is installing an automatic sampler at the Needles smelter.

Pinal County.

The Big Lead Mining & Smelting Co. is to build a 100-ton concentrating plant at its mine, near Florence, under the supervision of F. A. Adams. The plant will be equipped with Hancock jigs.

Yavapai County.

Morris Crump is developing his properties with a small force and is getting out rich ore. This group is near the head of Lynx creek.——A. G. Curtis is working his properties and getting good results, and J. P. Score, who has been working on his mines for several years, has also struck good ore in a shaft that he is sinking on one of his claims.——The Metals Mining Co. is running a tunnel on the Eureka mine, and making a raise to connect with the shaft. A large body of ore was recently struck in this tunnel when it reached the vein.——A. H. Mitchell is developing his Independence and Poor Man mines and has a shaft down 100 ft. on the latter, from which he has run two drifts, in which he has opened up a vein two feet in thickness. On the Independence mine he has two shafts down 30 ft., on a ledge carrying good values in gold and silver. The mine is on what is known locally as the Mudhole vein.

The Copper Mountain Mining Co. has cut a station in the shaft of the mine, near Stoddard, and as soon as the hoist is ready will sink to 600 ft. and will open orebodies by drifts and raises.——M. J. Whelan, superintendent for the St. Anthony Mining Co., has men at work installing a hoisting plant and other machinery at the Mark Twain and Eighty-six mines, near McCabe, preparatory to beginning development.——P. McLeod has sunk a shaft on his group near Prescott.——The Metals Mining Co. is running a tunnel on the Eureka mine, near Prescott, and is raising to connect with the shaft.——The owners of the Binghampton mines, near Stoddard, will shortly duplicate the present hoisting plant on the mines.

Yuma County.

The Wendendale Gold Mining Co. is contemplating the erection of a sampling plant at Wendendale, near Planet.——The Harqua Hala mine, near Planet, is to be re-opened after an idleness of over 10 years.

CALIFORNIA.

Butte County.

O. B. Perry, of San Francisco, representing the Pacific Gold Dredging Co., is building a Bucyrus dredge on the Jacobs tract, near Oroville. The dredge will be equipped with 7-ft. buckets, and will be ready for operation next week.

Kern County.

H. H. Blood, who is putting in a 10-stamp mill in the Amalie district, above Caliente, states that the new mill will be completed in 30 days and will be ready for custom ore within 90 days. He has power sufficient to operate a 20-stamp mill, and 10 additional stamps will be put in, if conditions warrant it.

Mono County.

It is reported from Masonic that the Liberty-Pittsburg claims have been sold to a Denver company by Dorsey, Phillips & Bryan. Work will commence on the properties the coming month, when a contract will be let to run a tunnel to tap the ledges that have been opened by the lessees.

Nevada County.

It is reported that a 15-ft. ledge of high-grade ore has been struck on the 700-ft. level of the Murchie mine, near Nevada City.——The Sultana Mining Co. has finished its air-shaft. Work will soon be commenced on a large mill for this mine.——W. Howard and R. Kemp will resume operations on their property at French Corral, near Grass Valley. A tunnel will be run to the ledge at depth.——G. Shebley and J. Orzalli are developing a claim on the Orzalli ranch, at Chicago Park, and are down 90 ft.——A portion of the new mill for the New York-Grass Valley mine, near Grass Valley, has arrived. ——The shaft at the Prescott Hill mine has been pumped out and sinking commenced. No work has been done at the bottom of the shaft since 1867. The compressor at the mine supplies power to 16 machines and two hoists.

Placer County.

W. P. Hammon will operate two dredges on Bear river near Sheridan this season. Machinery for the dredges is arriving at Sheridan.

San Bernardino County.

J. Faris, of San Bernardino, reports having located a claim near Banning. No mines have thus far been developed in this vicinity.

A rich gold strike is reported made 18 miles west of the Colorado river, near Needles. Over 300 prospectors are on the ground, and people pouring in from all sections. Saturday morning County Recorder Johnson expressed 500 location blanks to the new camp. A prospector who filed a location states that the strike was made early in February, but had been kept quiet until last Wednesday.

Shasta County.

The Great Western smelter, at Ingot, has been closed on account of bad roads, which prevent coke being shipped to the mines from Bella Vista.——The owners of the Red Ledge mine, near Redding, are considering putting in a 5-stamp mill, concentrator and slimer.——Hill, Spencer & Laycock have sold a one-sixth interest in their quartz claim near Kennett to R. W. Evans of Kennett.

Charles Smith, a miner, fell 320 ft. down a shaft in the Afterthought mine, at Ingot, on the 11th inst., and was killed instantly. He was returning from the dump with an empty car, which he pushed so rapidly that it broke the wooden bar shutting off entrance to the shaft when a cage is not resting on the chairs. The cage was above, when the bar gave way and the car fell into the shaft, carrying Smith with it.

Siskiyou County.

The Bills-Reichman mine, on Indian creek, near Fort Jones, has been leased to Stearns & Sullivan.——An air compressor, a 50 h.p. gasoline engine and a car of gasoline are now on the road to the Blue Ledge mine, in this county, near Medford, Ore. Three tunnels are being driven on different levels and winzes are being sunk to connect the tunnels.

Trinity County.

H. Ehrmann and E. S. Kise report having struck a pocket in the White Cloud placer mine, near Lewiston. ——P. L. Young, of Orleans Bar, representing English parties, has a number of quartz mines on Eagle creek, near New River.

The Laymon boys, who own a placer claim on Kingsbury gulch, five miles from Hayfork, have struck a back channel which is 60 ft. wide, which they can trace 600 ft. up the gulch. The gravel averages 25c. per pan on the bedrock. They have been piping for a month and have picked up $75 in nuggets.

Tulare County.

E. L. Blossom, of San Francisco, has bonded the C. Brown property near Plano. He will begin work within 60 days.——The Powell copper mine, near Porterville, has passed into the control of H. J. Mueller and others and will begin development. Supplies are now being shipped to the mine.

COLORADO.

According to the reports furnished by the companies, the United States Zinc Co., whose plant is at Pueblo, purchased, in 1905, 28,494 tons of ore containing 9,556 tons of zinc, an average of 33.5%. The production of spelter for the year was 6,544 tons. The United States Smelting Co., with plant at Canon City, smelted 33.000 tons of ore, containing 7,500 tons of zinc—22.7%; 2,900 tons of lead, 8.8%; 600 tons of copper, 1.8%; 300,000 oz. of silver, nine ounces per ton, and 2,200 oz. of gold, 0.066 oz. per ton. Excepting 800 tons of ore from Arizona, all was obtained from Colorado. The products of this plant are zinc-lead pigment and copper matte. The averages computed do not show the grade of zinc ore smelted, inasmuch as some copper ore, free from zinc, is smelted along with the zinc ore.

Clear Creek County.

The Dives-Pelican mine, near Silver Plume, is to have

an aerial tram, which will avoid delays in the delivery of ore to the mill.

Gilpin County.

(Special Correspondence).—The Fifty Gold Mining Co. has recently been organized to operate the old Gregory and Bobtail property. The Cook shaft, down 1,300 ft. will be continued to the 1,700 ft. level. They will crosscut at the 1,300 ft. and 1,700 ft. levels to the Gregory vein and also drift to the Fiske and Bobtail veins. To accomplish this work it is estimated the company will spend $150,000 for new machinery. A. B. Thompson, General Manager.

Black Hawk, March 10.

Illinois and Iowa people are associated with Coloradoans in the development of claims on the dividing lines of Gilpin and Summit counties, west of Russell Gulch, of which L. D. Bloom is manager. The company is called the Bald Mountain Mining & Development Co. It is the intention to run a tunnel 3,000 ft. to develop the group, the tunnel being in 100 ft. Part of the group is patented. For present development the L. D. B. shaft has been unwatered and sinking operations are proceeding, this shaft being down 85 ft. The company intends to sink to 140 ft. and crosscut and drift. They are talking of the installation of machinery in the future.

Sinking is in progress at the Morris shaft of the Pearce Gold Mining Co., in the Russell and Lake districts, south of Central City. A depth of 300 ft. has been reached and the company intends to sink to 400 ft. Ore is reported in the shaft. Frank Hardy is superintendent, and H. G. Pearce, of Denver, manager.

The Jupiter-Belmont and St. Claire mines, in the Russell district, are being started up by the Jupiter Leasing & Mining Co., under the superintendency of J. C. Williams, of Russell Gulch. A new shaft building is being built. The machinery consists of a hoist and boiler. It is expected that the top improvements will be completed inside of the next week. The main shaft, down 500 ft., will be unwatered and re-timbered wherever necessary, after which an examination will be made of the property to determine upon future operations.

Hinsdale County.

Two cars of ore went from Lake City last week, one each shipped by the Planet Co. and the Emerald Isle leasers.——C. E. Peniston has given a bond and lease on the Independence lode to L. A. Vinton, Sherman Williams, Ed. Lampert and Coley Kirker, for $20,000. The Independence is patented and situated on Sheep mountain, and has produced a great deal of ore in times past.

Lake County.

The Cloud City Mining Co. has been in operation three years and as a result of work done is in shape to produce a regular output of manganiferous iron. The shaft is 630 ft. deep with a good pump at the bottom. An eight-inch air-pipe, to which a small steam jet gives suction, carries good air to the breast of the north drift, now out 600 ft. and under Fifth street. Since the Home Extension shaft and ground was added to the Cloud City holdings, a connecting drift of 1,125 ft. has been run between the two shafts. In the vicinity of that shaft an output of manganese began two months ago in the course of development of the old ore-shoot. As a result of this work there is in sight at three different points what appears to be a strong body of this ore.

Las Animas County.

To divert the water of Las Animas river, convey it through a tunnel seven miles in length, generate 30,000 h. p., and return the water to its natural channel, is the plan of a project to be undertaken by the Animas Power & Water Co. Henry Jameson, of Indianapolis, is president and states that the work will cost $1,000,000. They own the Rockwood dam, between Durango and Silverton, which conserves water that generates 6,000 h.p. The dam is 55 ft. in height and will be raised to 110 feet.

Park County.

(Special Correspondence).—The Snow Storm Hydraulic Co. of this place has placed an order for 3,300 ft. of 28, 29, and 30-inch hydraulic pipe, for use on the Alma siphon line. This pipe will be put in commission as soon as the weather will permit of the work being done.

Fairplay, March 10.

Summit County.

(Special Correspondence).—Indications are for an early start in dredging and placer operations. The management of the Reliance Dredge Co., in French gulch, will put on men next week to overhaul the dredge and get it in shape to start digging as soon as the weather permits.——The Abundance Co. is installing a large boiler on its property at Yuba Dam flats. The company intend to sink to solid formation by shaft and a churn drill, when a diamond drill will be employed. The main tunnel being run by the same company into Mineral Hill from French gulch is in 400 ft. Eight hundred feet will bring the adit to the Abundance. It will also develop the Mono group, which adjoins the Abundance and Oro.——At Kokomo P. W. Breene has disposed of his holdings for $500,000. The property has been purchased for a Milwaukee syndicate. They intend to erect a large mill.——Another important deal has been closed in Breckenridge whereby the Wire Patch has been acquired by Mark G. Evans of Denver for his associates. This property is situated on Farncomb hill. The whole of this section of Farncomb hill would, it is thought, pay to put through a mill of large capacity.——Foote & Hight are working their lease on the Bullion King of Gibson hill and are making regular shipments of high-grade zinc ore.——The Atlantic mine, on North Star mountain, is yielding 15 tons of gold ore daily. When more teams are available, the operators will increase the output to 25 tons a day.——The main ledge in the Country Boy is improving and promises to become one of the chief zinc producers in the district. The drift on this ledge is in 350 ft. and has passed the area where the zinc was worked out above. There is now showing a ledge 4 ft. wide.——The Sallie Barber mine, on the north slope of Mt. Baldy, is being worked by Leadville and Canon City parties. The vein has opened up in the shaft to a width of 3 ft. Sinking has been stopped and drifting is in progress. It is intended to start a new main vertical shaft. Two cars of high-grade zinc ore have been shipped to Canon City.

George Horne, working the Leona and Edna properties, brought in samples from a 3-ft. vein which assayed up to 10 oz. gold per ton, besides good values in silver.——A strike has been made on the Silver King property by Widmar & Dean, situated on the crown of Nigger hill, at the foot of Bald Mt. In drifting east from the Dean shaft away from the main ledge, a branch vein was encountered, carrying lead sulphide in bunches. The ore is high grade and carries gold and silver.——The Jessie mine is opening up well in the Glenwood level workings. Manager Morgan is having the 40-stamp mill overhauled.——The Wellington mine is shipping regularly. The Gold Dust is getting ready another shipment of gold ore. The Morning Star mine is running steadily and when spring opens will make shipments regularly.——The Old Union Mining & Milling Co. will get the mine in shape for making a continuous run.——J. E. Parker, of Memphis, Tenn., president and manager of the Mary Verna and North American mining companies at Frisco, arrived here on Friday last with 14 Southern capitalists who are interested in the Ten Mile mines.——The Minnie mine, in Mineral Hill, is producing shipping ore and piling up milling ore for concentrating in the spring.

Breckenridge, March 10.

IDAHO.

Kootenai County.

The Gold Ridge Mining Co., owning six quartz claims on the St. Joe river, near Cœur d'Alene, cut the main ledge in the bottom of the 90-ft. shaft last week. A tunnel will be run for drainage.——It is reported that a 10-in. vein of galena has been struck at 100 ft. in the tunnel at the Rose of Killarney mine near Priest river.——The Green Mountain Mining & Milling Co. will put in a 5-stamp mill on its property near Tyson, and a larger mill will be installed later.

Idaho County.

The Idaho Consolidated Copper Co. will erect a reduction works with a capacity of 100 tons on its property near Grangeville, and an electric plant will be installed. Seven hundred feet of tunnel has been run.——A stamp-mill will be built on the Dice property near Grangeville.——The Copper Queen Co. will instal a smelter on its property near the Evergreen mine at Clearwater, where a ledge 12 ft. wide has been uncovered.——The Big Baldy Mining & Milling Co. will increase the force at its mine near Hump and more machinery will be added.

A. W. Boyd has put in the cyanide plant for the Seattle & Idaho Mining & Milling Co., at the Comstock mill at Dixie, and the mill is in successful operation. The plant has a capacity of 30 tons daily. The ore is classified and the slimes run off, as they are comparatively valueless. The ore is crushed by two 2-stamp batteries, crushing to four-mesh screen. The stamps are only run one shift and crush 30 tons. The ore is mined by the glory hole system, one man breaking the rock and tramming it to the crusher. At present they are leaching the pulp for 24 hours, and save a fair percentage, which, with the extra amount of pulp handled, gives satisfactory returns. The ore is being mined and milled for 90 cents a ton, and when they can use water for power, it will be materially lessened.

Nez Perces County.

Difficulty has been experienced at Pierce this spring in getting supplies and machinery from the railroad, owing to the bad roads. The Idaho Co., which is installing a dredge, has kept teams constantly on the road between here and Greer, and almost all its machinery and lumber have been delivered. All the available men here and a number from outside points have been employed by this company, and work on the dredge is progressing.——J. W. Nelson, president of the Ozark Mining & Milling Co., and J. P. Rossman of St. Paul recently inspected the work at the Ozark. Since this company took the mine last fall 1,000 ft. of tunnel work has been done.——Frank Cole, the patriarch of the camp, has been identified with the Pierce City district since 1861, and was sheriff of Shoshone county in the early days.

Shoshone County.

L. W. Stedman will put in a sawmill and build a 2,700-ft. flume on his property on Pritchard creek, near Murray. The creek will furnish 100 h. p. in the lowest stage of water, and will operate a 10-drill compressor. Power will be furnished the Paragon, Blackhorse and Chicago-London mines.——A new Huntington mill has been installed at the Hecla mine, near Gem. S. Logan has shipped a car of ore recovered from mill tailings in the creek by means of Joplin jigs.——Sinking has begun on the Rex mine, near Wallace. A shaft will be sunk on the ore-shoot to 100 ft. The mill will start March 15, after having been closed down on account of water shortage.——A compressor will be installed at the Columbus group, near Murray.——Five stamps are dropping at the Mother Lode, near Murray. A concentrator leased from the Golden Chest has been installed, and Superintendent Thyne is making preparations to start up the Golden Chest 20-stamp mill.——The Golden Reward mill, near Murray, is dropping stamps during the day.

The bailing of the shaft of the Helena & Frisco mine is proceeding. The workings are unwatered to 600 ft., leaving 800 ft. to be unwatered. The quantity of water hoisted so far is 43,000,000 gal. To complete the unwatering of the mine and instal the pumps for continuous operation will require two months more, but Manager Ehrenberg expects to begin mining about the end of April.

The development of the recently discovered ore-shoot in the Tamarack & Chesapeak mine continues. The drift has been run with a width of 14 ft. for two weeks. This drift is on the hanging-wall side of the vein, and has shown in the face from 6 to 9 ft. of clean shipping ore, which was sacked as it was broken down. For the greater part of the time the rest of the face has been concentrating ore of such grade that it could be sorted by hand three tons into one. Last week a second streak of clean shipping ore appeared on the foot-wall side of the drift. A drift has been started on this streak and now shows three feet of clean ore. The ground between the two drifts is slightly mineralized and is left for the present.

A strike was recently made near the head of Placer creek, six miles from Wallace. It is a gold strike—something new in the Cœur d'Alene of late years. The discovery was made on the Vienna and International claims, owned by N. Miller, J. and A. Livingstone and J. H. Graham. They are old locations, having been staked in 1891 and held by the present owners ever since. They are situated two miles from the wagon-road up Placer creek, with which they are connected by trail. The owners of the property have been driving a crosscut tunnel to develop a ledge. When in 100 ft., they cut an 18-in. ledge of quartz and iron and passed it as not worth anything. As things were far from lively on Placer creek, little was done outside of annual assessment work for the past few years and the rock was so hard in the face of the tunnel that the owners looked for an easier place. Alongside the vein of quartz and iron the rock was broken up and easy to work, so it was concluded to represent for the year by driving alongside the ledge. Two weeks ago they broke into the ledge of iron to see what it looked like, with the result that a solid body of white quartz and iron was crosscut for a width of 10 ft. A sample went $60 per ton in gold. A number of other samples ran from $14 to $45. Samples of the clean white quartz assayed ran $4 per ton. The owners have now concluded to open up the ledge with a view to shipping, and are confident they have a bonanza.

MONTANA.

Granite County.

The district about the Garnet group has been active, the few months past, particularly at the Clipper group, and others near them on Mineral hill, near Pony. The Garnet mine is increasing shipments to the Helena smelter. On the Diamond G claim is a 50-ft. shaft, toward which Daniel Brand, who has the mine under bond, has been running a tunnel to tap the ore at a depth of 130 ft. The shaft is all in ore, which assays $27 in gold and some lead. The tunnel is in about 120 ft. The Eighteen-Ninety lode was recently bonded to Kern Adams, of Butte. Float on this claim assays from $3 to $100 per ton. Mr. Adams is driving a tunnel into the hill, in which he has struck, sooner than he expected, a four-foot vein of good ore. Near the Diamond G and above the Eighteen-Ninety the Mogul has a 400-ft. fraction between the two latter. The Mogul is owned by Charles Young, W. R. MacFadden and John Milligan, and the fraction by Charles Young and A. J. McCormick. The Mogul has a 20-ft. shaft, with 18 in. of ore assaying $26 in gold and 16% copper. A crosscut tunnel has been run into the hill 130 ft., with 80 ft. more to run to tap the lode. The fraction has an 80-ft incline, with a drift at the bottom. Some of the ore assays $38 per ton. Several more prospects on the same hill are opening up favorably.

A rich gold strike at Six-Mile house was reported last week, which has resulted in much activity there. Adjoining claims have been located for several miles on both sides of the canyon and prospectors are digging holes and making the necessary showing for locations. Several of the prospects are reported to be encouraging.——Mr. Bennett and sons are driving a tunnel to tap their lead. They are also doing work on other leads parallel with the original discovery, and in one copper ore is found.

P. Loughrin, who owns a ranch one mile north of Bennett's, has struck a 14-ft. vein of ore. His strike is not new. Mr. Loughrin had been at work on his claims for several years, having a good showing in a number of places. He has been running a tunnel to cut his lead. The rich strike at Bennett's caused Mr. Loughrin to renew his efforts and a few days ago a strong vein of ore was cut.——Other prospects are showing up rich copper ore in several places within a mile or two of Flint station. The claims owned by Bhen, Blackburn & McRae near Flint, in addition to the copper prospect, have an eight-foot vein of lead-silver ore.

Jefferson County.

Near Clancy, and situated three miles east of the Liverpool mine, are the Raymond and Superintendent mines of the Raymond Silver Mining Co. C. F. Murphy, of Great Falls, is president of the company: O. D. Thompson, of Butte, vice-president; Jesse E. Teague, of Clancy, secretary. A tunnel has been driven on the main lead of the Raymond 260 ft. and a shaft sunk 49 ft. In driving the tunnel 11 tons of ore were taken out and shipped to East Helena. The first shipment ran $55 per ton and the second $62.

Missoula County.

Drifting will be started at the Tarbox mine near Saltese as soon as crosscutting of the ore is completed. The winze will be sunk to the 600 level and another crosscut made at that level.

Recently the Ann Arbor Mining Co. transferred to R. deB. Smith and associates a large tract of placer ground on Dry Creek, near Iron Mountain, for $125,000, the first payment being made the latter part of February. This ground will be worked on a large scale. Mr. Smith consummated another deal by which he acquires another 140-acre tract of placer ground on Dry Creek, near Missoula, for $75,000. This ground is in the same gulch as the Ann Arbor Co., but is higher up and has never been opened up, although it prospects well. The sale carries with it a water right of 2,000 inches. It is not likely that dredges will be installed, as the ground is in an ideal locality for hydraulicking, with an abundance of water.

Manager Daxon, of the Tarbox mine near Saltese, reports the showing in the crosscut on the 500 level as being good. The crosscut has cut the ledge for 30 ft. without reaching the hanging wall. The first 12 ft. of the ledge is concentrating ore and the rest is white quartz impregnated with galena which occasionally occurs in large masses. He has decided to resume sinking the winze. When the 600-ft. level is reached another crosscut will be run to the ledge.

Silver Bow County.

(Special Correspondence).—The Anaconda has for some time been drifting on the vein which was opened several months ago at a depth of 2,200 ft., and the richness found at the crosscut continues. The same vein has been encountered at the depth of 2,400 feet.

The report is circulated in Butte that none, or at least few, of the big producing mines of the United Copper Co. are included in the Red Metal or Butte Coalition companies, supposed to have been formed to take over the Heinze properties. It is stated that the chief assets of the Coalition are some of the smaller mines of United Copper and the Alice group. If that is true it is probable that, in the settlement with Heinze, some of the best ground in dispute was turned over to the Amalgamated Company.

The Furnace Creek Copper Mining Co., organized by Patrick Clark, of Spokane, and others, has been floated, and 125,000 shares of stock allotted to Butte were subscribed in less than hour. The property of the company is near Death Valley, Cal., where prospecting has been carried on for some time, it is said, with encouraging results. Mr. Clark has also secured a number of properties in the undeveloped portion of the East Butte district, and will organize the Bullwhacker Mining Co. to take them over.

A $35,000 gold bar, the product of a 40 days' run of the mill at the Cable mine, 50 miles west of Butte, was shipped to this city a few days ago.

The Butte Copper Exploration Co. has pumped the water from the 400-ft. shaft on the Six O'clock mine and in a few days will have the old shaft ready to resume sinking. The property of the company lies just north of and adjoins the Pittsburg & Montana mines.

The Butte & Bacorn Co. has been organized to develop a number of claims still north of the Butte Exploration Co. This will be a close corporation and the public will not be asked to take a chance. Ten capitalists, mostly from Pittsburg, have put up $45,000 each as a working capital, with which the ground will be explored.

The General Development Co., backed by the Lewisohns of New York, is making good progress in re-opening the Altoona group, east of the city, consisting of the Altoona, Amazon, Maccaroni, Montgomery, and a portion of the Coleen Bawn quartz claims, and the mineral rights to a portion of a placer claim. J. Parke Channing spent several weeks in Butte examining the properties. Before leaving, Mr. Channing started the work of cleaning out the old shafts and workings, and when that is completed sinking and further exploration will be done.

Butte, March 11.

NEW MEXICO.

Luna County.

H. R. Fry has made a find near the old Victoria mines, south of Gage. Recently he opened negotiations with the Hearst-Tevis estate regarding the dumps of the Victoria mines and visited the properties. The Victoria mines are in a small hill, three miles from Gage station. Large pockets have been found in the mines containing ore that ran high in lead and silver. It was worked many years ago. Some years ago Michael Burke, of Deming, secured a lease on the mines and followed a streak of ore which led to a pocket, from which it is reported he cleaned up $75,000. While Mr. Fry was at the mine, he noticed a couple of more small hills, and concluded to look them over, and found a prospect hole on one. Ore from the dump assayed 25% lead and 40 oz. silver. He located the long-abandoned prospect. The deepest opening on these claims was not over 15 ft. The place is near where H. F. Brinkman discovered the abandoned wolframite property.

Otero County.

An 85-h.p. boiler and an air-compressor with a capacity of eight drills and two hoists, one 8 by 10 on the surface and one 4 by 6 underground, have been installed at the Nannie Baird mine, near Jarilla. Levels will be cut and driven every 75 ft. in the mines. The vertical shaft is to be sunk deeper and a new three-compartment working shaft sunk where a diamond drill-hole was put down several years ago. A vertical shaft is being sunk in ore at the mouth of the old incline shaft. This will be 4½ by 8 ft. in the clear. —— Two 85-h.p. boilers are being installed at the old power house at the Lucky mine, near Jarilla; also a 16-drill compressor. At the collar of the shaft an 8 by 10-in. hoisting engine is to be operated by compressed air. The entire workings are to be tracked, and on the third level the formation is to be crosscut to the first, second and third contacts. An aerial tramway will be run from the Lucky to the Iron Mask, at which three machines will be placed. Bins will be erected at the mines with a capacity of 500 tons.

The Electric Mining and Milling Co. has been organized to work the placer grounds at Jarilla. T. R. Hall is president and G. E. Moffett, of Jarilla, secretary and manager. They expect to have their plant in operation by July and think they have enough gravel to run 25 years. Crystals of zircon have also been found in the placer ground. This has heretofore been a dry-washer camp and by this process gold has been produced every year; but, with the advent of water through the pipeline now being laid, new life will be given to placer mining. The reservoir will hold 25,000,000 gal. and will supply water for the mills and smelters handling the ore from the lode claims and also abundance for placer ground.

Sierra County.

The mill at the Enterprise mine, near Mogollon, is to begin operations in April.——The Black Peak mill, near Hillsboro, is running steadily on ore from the Wicks mine. M. F. Burks is in charge of the mill.——The contract for building the 400-ton smelter at Jarilla for the Southwest Mining and Smelting Co. has been let. The smelter will cost $300,000.——Surveyors have been making a survey of a tramway from Pyramid to Lordsburg. The survey shows that it would be an economical way of getting ores of that district to the railroad.

A strike of gold and silver ore was recently made in the Good Hope-Bonanza mine in Las Animas mining district at the 150-ft. level. There is a pay-streak of two feet running 3 oz. gold and 200 oz. silver.——This district has had a number of new strikes and many of the old mines are being worked. New mills are being constructed and the old ones remodeled and put in order.

NEVADA.

Esmeralda County.

(Special Correspondence.) — The new Kinkead mill completed about March 1 is running on ore from the Kendall mine, on Columbia mountain. In this mill are three of these mills with room for two more. There are also three 6-ft. vanners, and a concentrate is being saved worth $120 per ton. The ore is amalgamated on outside plates. A cyanide plant is contemplated by the Kinkead Mill & Mining Co., owning the plant. J. H. Kinkead is superintendent. On the mines about Goldfield a large amount of work is in progress, principally by lessees, who ship the high-grade ore and send the lower grade to the custom mills. A great many of the floating population at Goldfield have gone to Manhattan, and other newer camps in this part of Nevada. A good body of ore is reported on the 300 level of the Sandstorm mine, which will have a tendency to stimulate deeper mining in the camp. As water is scarce in the district, all the water used in milling at the Kinkead mill is settled in pointed boxes and pumped back and re-used, with a loss of 25 to 50%, depending on atmospheric conditions. The water used at this mill is pumped from the Highland mine at Diamondfield, four miles distant, and costs $1.50 per 1,000 gal. This mine makes about 120,000 gal. per day, which affords the owners a substantial revenue.

Goldfield, March 12.

Manager Bertschy, of the Aurora mine at Aurora, states that the tunnel will be continued 120 ft. to the foot-wall.——Peters and Pettitt and others, who recently secured block 7 of the Columbia Mountain Mining Co., at Columbia, are preparing to instal a whim and continue sinking.——An important strike is reported on the Combination Co.'s ground at Goldfield, where a 7-ft. body of ore has been disclosed. A force has been put to work drilling into the body to find the foot-wall.

The Nevada Iron Cap Mining Co. is preparing to put down a shaft from the end of the present 95-ft. tunnel to a depth of 500 ft. on the Iron Cap mine in the Palmetto district, near Goldfield. —— Arrangements are being made to resume operations on the Gold Quartz group in the Red Mountain section, three miles east of Diamondfield.——The Diamond Triangle Co. will crosscut at the 75-ft. point in the shaft on the Lulu Fraction mine, near Diamondfield.——The new 25-h. p. gasoline hoist on the Booth claim, near Goldfield, began operations last week. The shaft will be sunk 200 ft. —— Sinking has been resumed on the Peer mine, near Goldfield. —— F. N. Fletcher and others, of Goldfield, have taken a lease on the old Bullion mine at Montezuma, and have put men at work to complete the tunnel. —— A hoist and other mining equipment has been ordered by the Chipmunk Gold Mining Co. for the Chipmunk claims at Manhattan.

Thirteen sacks of ore mined on the 50-ft. level of the Sandstorm, reported averaging $6 per pound, and 13 sacks of ore, averaging between 2 and $3 per pound, were recently sent to Selby. The smelter company reported the following result: Thirteen sacks of ore, averaging 560 oz., value $11,200 per ton; thirteen sacks of ore, averaging 230 oz., value $4,600 per ton. The rich ore was mined in the Sandstorm during the second week in January, and was of so great a value that the sacks containing the earth were stored in the vaults of the John S. Cook bank until they could be prepared for shipment by express.

Marietta, which was a prosperous mining camp but abandoned since 1880, is likely to come into prominence again, a Boston syndicate having secured an option on a majority of locations in the district.

Eureka County.

D. C. Turner and J. Campbell, of Reno, are at Palisade, arranging to send out the first shipment of bullion from the new 50-ton smelter of the Mineral Mining & Smelting Co.

The Richmond-Eureka Co. now has 90 men employed, not including officials.——The cribbing of the Eureka Consolidated shaft has been completed to the 900 level, and as soon as the guides are in place miners will go to work in the levels.——The Richmond-Eureka Co. has increased its outside force of graders and builders. The company is building an office at New Town and grading has been started for a warehouse.

Humboldt County.

Since installing the new hoist and pump at the Bonanza King, near Lovelocks, Superintendent Cornes has been drifting on the 225-ft. level to catch the ore-shoot. There was a fault in this shoot and after it had been mined to 200 ft. deep, 300 ft. long and 4 to 6 ft. wide, this chimney gave out. After drifting 50 ft. from the bottom of the shaft the men are now coming into the same ore-shoot, which had yielded so richly at the top. Pannings show that it carries good values.

Castle & Lynch have returned from California and are going to put in a five-stamp mill on their property at the head of American canyon. They have purchased the mill at the mouth of Limerick canyon and will move it to American canyon. They also have a gasoline engine and will start in with this outfit to work ores from their claims situated at the top of the divide between American canyon and Dry gulch.

Lincoln County.

The Quartette mine is a mile from the town of Searchlight. The Quartette mills that are being dismantled are 18 miles from Searchlight. The mills of the Quartette Co. are to be reconstructed at their mine.

The Ross group, near Uvada, Utah, is being opened by a tunnel which is expected to cut important ore-bodies.——The Uvada Gold Mining Co. has begun tunneling to crosscut three claims in the company's ground, which joins the Snowflake and Jenny properties.——The Jenny Gold Mining Co. is sinking a shaft on its No. 7 claim, near Uvada, Utah. A new ledge is being opened. ——Work is being prosecuted in the Indiana tunnel of the Deer Lodge Mining & Milling Co. at Deer Lodge. The Iras mine at Deer Lodge is to be opened by Moody & Dameron, who are now putting the Homestake mill at Deer Lodge in shape to handle the output of the Iras. ——C. A. Hopkins, of Searchlight, states that 20 stamps will be added to the Quartette mill, near Searchlight, which has 20 stamps in operation.——J. Brockman and Mr. Portalis, of the Good Hope and Duplex mines, near Searchlight, state that both will be opened to a depth of 1,000 ft. before a larger mill will be put in.——Contracts for sinking have been let in Searchlight district as follows: Searchlight Bonanza, 240 ft.; Searchlight Copper-Gold, 150 ft.; Combination, 240 ft.; Mountain, 125 ft.; Goldyke Mining & Milling Co., 225 ft.——The Searchlight Mining & Milling Co. reports having opened a large body of ore on the 250-ft. level at its mine, near Searchlight.——The Searchlight Treasure Gold Mining Co. reports finding a large vein of free-milling ore while tracing a lead on the Gavilan claim at Searchlight. This find is in the center of the town of Searchlight——W. M. Brown, manager of the Long Beach Mining & Milling Co., has let a contract for the first 300 ft. of sinking on the Alice V. lode, near Searchlight.——A flow of 40,000 gal. of water is reported at the 240-ft. level in the Santa Fe mine, near Searchlight.

Baxter Springs is promised increased activity through the letting of 10 leases by the Baxter Springs Mining Co. on their claims. Leases will be 100 by 750 ft., 10 months' time, 20% royalty, no bonus, 25 shifts the first month and 52 shifts per month thereafter. There is plenty of wood, also water, on the ground, and, with such favorable terms and conditions, it is expected the lessees will do well. Sixteen new tents were erected at Baxter Springs in three days, making the camp one of 400 people.

J. W. McNeil has given an option on his mining interests in the Baxter Springs district. Mr. Turner, of Baxter Springs, intends starting a stage line between Tonopah and Baxter, making three round trips weekly; fare, $6 each way. He reports a strike on the Davenport property, four inches of black quartz on the hanging wall of the ledge being impregnated with free gold.

Nye County.

(Special Correspondence.) — A few lines from this locality may be of interest. Being a miner, I struck this camp about a year since, and after looking around a short time concluded it was good enough for me, so here I am yet and not sorry for stopping, although I haven't sold a single prospect, since making my first location. I brought lumber here from Manvel on freight wagons, costing here $115 per thousand ft., over 110 miles; bought grub here, and glad to get it: Flour $6, onions 14c. per lb., spuds $7.50 per sack; bacon 23c., hams, 25c., other things in proportion, but it shows to anyone the reasons why this locality has not advanced faster than some others—namely, distance from any railroad and cost of living. But now times are changing, and why? The mines are here, and the Tonopah & Tidewater Railroad is running regular to the Indian creek, where they are putting in a station and laying steel beyond at the rate of one mile per day, to the next station, 30 miles north of Indian creek, which will soon be reached. Distant from Johnnie seven miles, two grading camps are already across the Spring Mountain range, and are going for Bullfrog. Ash Meadows and Miller's Wells will soon have two streaks of steel and the right of way across its dreary sands, and the days of famishing freight teams and stage horses will be able to step aside and rest, while the iron horse goes jingling by—'hurrah for the iron horse!' he brings us in touch with the outside world; brings us lumber, machinery, visitors and investors, and gives us also a chance to ship out lead-silver ore, and hematite, of which we have some grand properties, and all hands here who own this character of mines are exerting themselves to see who can get the first carload out toward Salt Lake, or the Caliente smelters. The Johnnie mines, now down 700 ft., and belonging to Los Angeles people, require very slight mention. It is a *mine*—pronounced so by some of the best experts west of the Rockies. For instance, on the 500 level, with a 5-ft. vein, assaying $40 gold; on the 600 level, the vein 25 ft., assays from $18 to $45, while on the 700 level they are crosscutting for the ore, proving, as the company has already, that this 200-ft. ore-shoot extends up to grass roots.

A mining man from Utah has just found a large body of moiybdenite, four miles north of Johnnie, and put a force to work developing, and for a wonder it is inside of three miles of the new railroad, now building.

L. L. Patrick purchased a lead-silver property making a substantial cash payment, and has had men working constantly since and their 'super' tells me they are O. K. and wants more. I learn tonight of a great strike of silver north of Sterling, perhaps 20 miles north of this place—names of lucky discoverers not known here. The store in this place has recently changed hands and the purchaser has replenished his stock of general merchandise. Two shafts 50 ft. deep on the Battery ledge 6 ft. wide in bottom show free gold and high values. The Red mine group contains much shipping ore; main shaft down 40 feet, showing a vein increasing in width and value of ore increasing. A tunnel recently started to tap the ledge at depth shows fine ore in face, while from another group, the Rainbow No. 3, assays average $24 gold; these are all new finds, with the exception of the Johnnie Consolidated Co. Latest assays from Beryl group show 50 oz. silver, $12.50 gold and 20% lead. Shaft on a quartzite extension is 40 ft. deep and crosscut run 38 feet in ore which assays average $12.20. Gould & Place (new arrivals) have started a shaft on their lead and silver locations and are piling ore on the dump awaiting cars to commence shipping, and they haven't been on their locations to exceed three weeks. A British Columbia mining man, Rathburn, has purchased some lead and silver claims on Mineral flat and has men at work developing. There are others in this locality owning extensive lead-silver properties, all showing paying ores—as soon as we can get railroad transportation. West & Boller, Miller & Lampfrey, Lake, Smith, Body and Beauregard, all have properties of which they may well be proud, for they have staid with them, feeling that they could ill afford to let go, provided a railroad should ever come this way, and soon their hopes are to be realized, as the Clark road is practically here, and the Borax road, from Ludlow, has finished 40 miles of grade

and has 22 miles of track laid and still coming with steel at the rate of a mile per day, and will pass within 12 miles of this place on the west. A batch of Salt Lake men with a grand, good prospecting outfit, just arrived to look over this locality, intent on investing in something, no matter how extensive. They are examining the Clanahan mine which shows a ledge at 100 ft. in their tunnel assaying $104 gold. They have discovered an immense body of copper ore within a few miles of here, as they were coming in from Los Vegas.

Johnnie, March 10.

A contract for a 50-ft. shaft has been let on the Bullfrog-Keystone mine, four miles south of Beatty——The Gibraltar Mines Syndicate, of Salt Lake City, Utah, reports that it will equip the Gibraltar mines, near Bullfrog, with machinery and will sink a working shaft to a depth of 400 ft.——S. Newhouse, of Salt Lake City, has bought a controlling interest in the Montgomery Mountain Mining Co., owning claims in the vicinity of Bullfrog. He announces that a compressor, assay office, blacksmith shop and other buildings will be placed on the property.

It is reported that the Pinenut mine, at Manhattan, has been sold for $175,000 to C. D. Parker and F. W. Benedict, of San Francisco.

T. L. Oddie, representing the Eclipse, J. H. Carstairs of the Denver, and Sherwood Aldrich, representing the Tramps, are reported to have consolidated these Bullfrog properties. The new company is known as the Tramps Consolidated Mining Company.

The ore shipments via the Tonopah Railroad for the week ending March 9 were as follows: Tonopah Mining Co., 1,790 tons; Montana, 125 tons; Tonopah Extension, 695 tons; Belmont, 198 tons; Midway, 90 tons; West End, 43 tons; Jim Butler, 50 tons; Briggs & Evans, 34 tons; Nevada Alpine, 30 tons.

The Las Vegas and Tonopah railroad, under construction by W. A. Clark and J. R. Clark, is now in operation as far as Indian Springs, 44 miles from Las Vegas. A large amount of freight and passenger business for the Nevada goldfields is being handled. It is said that the new line will be completed to Bullfrog, 70 miles from Indian Springs, by May 1st.

Storey County.

Work has been resumed on the 425 level of the Gould & Curry and the north drift from the main west drift is being advanced in low-grade quartz.——Surface tunnel No. 1 on the eastern edge of the Dean ledge, owned by the Occidental Consolidated Mining Co., on the Brunswick lode, near Virginia City, is in 35 ft. in porphyry.——The West Justice tunnel of the Justice Co. is cutting low-grade quartz.——The Challenge-Confidence-Imperial main north drift from the Yellow Jacket shaft on the 900 level is in 709 ft. from the station. The face is in low-grade quartz.——On the 1,400 level of the Belcher mine the joint Belcher-Crown Point north drift from the east crosscut from the Belcher incline has been advanced 12 ft. through an old stope, making its total length 172 ft.——The joint Overman and Seg. Belcher south drift on the 1,400 level has been advanced six feet, making its total length 42 ft. in Seg. Belcher ground; face in hard, low-grade quartz.——Mexican reports having had $8,804.77 on hand March 1, 1906. Utah had $80.15 on hand and owed the bank $3,000. The latter company is collecting an assessment.——The water in the C. & C. shaft was 106 ft. below the 2,350-ft. level station on the morning of the 13th inst.

Washoe County.

The Rocky Hill Co. has commenced a tunnel to cut the orebody at the Rocky Hill mine, near Washoe City, at a depth of 500 ft.——W. L. Stevenson has bought a 25-stamp mill and a cyanide plant for the Green Hill Mining Co.'s proposed plant at Wadsworth.——C. W. Clapp, general manager of the Nevada Commonwealth Mining Co., is arranging for a reduction plant.

OREGON.

Baker County.

The sinking plant and compressors have been placed at the Dixie Meadows mine, near Prairie City, and the development of a 40-ft. ledge to the depth of 300 ft. will be begun.——E. T. Forrester has purchased the Ophir claim, near Prairie City, formerly owned by J. Forrester and G. Riley.

This week's production at the smelter totaled six cars of high-grade matte, the Idaho ores having been received despite delays incident to the breaking up of roads. The warm weather is playing havoc with the roadways and they are afraid that shipments will be slow for the next few weeks. They have started hauling halfway on sleds and established a midway station, from which the ores will be hauled in wagons to the railway station as soon as there are bottoms to the roads. Local shipments have continued, the regulars sending in quantities of ores and concentrates. The Copperopolis sent a car of concentrates. Gold Bug managed to get in eight tons of its high-grade stuff but it also must await better roads before resuming shipments.

Coos County.

The placer properties owned by the Commander Mining Co. are now equipped and two giants were operated last week.

Jackson County.

The Siskiyou Copper Co. has begun driving a 25-ft. tunnel at its mine in the Blue Ledge district, near Ashland.——Superintendent J. D. Heard has been working two giants at the Sterling mine, near Ashland.——A new compressor has been set up at the Blue Ledge mine at Joe Bar, near Ashland. Four winzes are being sunk.——T. W. Hill and others have purchased 40 acres of mining ground adjoining the Shorty-Hope mine, near Ashland. Mr. Hill is opening up other orebodies in that vicinity, preparatory to the installation of a reduction plant.——L. B. Chase will resume development at the Palmer mine.——It is reported that a cyanide plant will be installed on the Shorty-Hope mine, 3 miles west of Ashland.——A reduction plant is to be installed on the Wild Goose mines, five miles west of Ashland.——The Cyanide Gold Mining Co. is having plans drawn for a reduction plant to be installed on its property, near Ashland.——An air compressor has been installed at the Bill Nye mine, near Medford.——E. C. Faucett and associates are preparing to open up the Wright-Eckelson claims on Elliott creek, near Medford. They will put in a complete hydraulic plant, including giants and other machinery.

Linn County.

The Cinderella Mining Co. will erect a mill near Albany in the spring.

Malheur County.

C. N. Matthews and M. F. Hull have opened the Evening Star mine in the Sucker creek district near Grants Pass.

Union County.

The Co-operative mine near North Powder has installed a new hoist and has ordered machinery to cost about $7,500.

SOUTH DAKOTA.

Lawrence County.

The Gilt Edge-Maid property is at Turner. It is a low-grade proposition that requires large milling facilities and careful management to produce profits. The orebody is exposed 300 ft. long, and 75 to 85 ft. wide. Its total length is not known. Six hundred feet northwest of the present workings the ore has been found, and it may be continuous. On the lowest level of the mine are six chutes through which the ore is drawn that is broken in the open cuts. Several thousand tons of ore have been broken and can be drawn as required. The body is nearly vertical. The mill tunnel is 100 ft. below the top of the open cut, and the lower level 100 ft. below the mill tunnel level. From the open cut the ore goes partially to the chutes on the lower level. From the main tunnel level the ore is trammed to the mill, direct. From the lower level it is hoisted to the main tunnel and trammed to the mill. The open cut is 300 ft. in length, in the present workings, and 85 ft. wide. In mining raises are made from the lower level, breaking into the bottom of the cut. These raises are timbered and equipped with chutes. The ore broken in the cut passes by gravity through the chutes and is drawn into cars and conveyed to the mill. On the edge of the cut a hole usually 10 ft. deep is drilled. It is chambered by firing two or three light blasts of dynamite, then a big charge of black powder is poured in. This is fired, and the result is the breaking of a large quantity of ore. Boulders too large to handle are broken up with dynamite and hammers. The ore is conservatively estimated at $3 to $4 a ton. Occasionally bunches are found that assay above these figures, but they are not reckoned in the general average. At some points in the mine good-sized bodies of $10 and $12 ore are exposed. The Gilt Edge-Maid mill is operated by electric power. A number of small motors are used, so that each unit of the plant may be operated separately.

UTAH.

Grand County.

E. T. Wolverton has commenced the delivery of 5,000 tons of manganese ore for the Colorado Fuel & Iron Co. from their mines south of Little Grande.

Juab County.

(Special Correspondence).—A notable revival of interest in the Tintic district is marked by the recent increase in the number of operating mines. The advance in the price of silver has restored confidence in this once famous district, particularly near Eureka. From here the Centennial-Eureka mine, of the United States Mining Co., is shipping silver-lead ore weekly, and is now finding copper with increase in depth. It is an interesting fact that, contrary to the predictions of the geologists of the Survey, the best stopes are being opened on the cross-fractures and not on the main north and south fissures. This is also true of a number of other mines in the district. The greatest depth has been attained in the Gemini mine, of which Jackson McChrystal is superintendent. The main 1,600-ft. shaft, while not the deepest in the camp, has reached the lowest orebodies, as its collar is so low. While sinking a winze to the 1,700-ft. level water was struck at a depth of 1,650 ft., and continued pumping has failed to more than temporarily lower it. This evidently establishes the water level of the camp, for above it the mines are dry. The ore occurs chiefly as lead sulphide, with quartz gangue, filling fractures in limestone, which is underlaid by quartzite and intruded by masses of monzonite, and later, much of it buried by flows of rhyolite and andesite. All the important ore deposits are confined to the limestone, with the exception of a few mines in an intrusive rhyolite, near Silver City. A number are close to the contact, particularly in the Beck tunnel, which, though nearing the contact, to date has opened no ore other than that in the limestone. There are no important lead-silver mines on the lime-igneous contact. The Eureka Hill mine, at Eureka, is being profitably worked by lessees, as is also a part of the Bullion-Beck, in which Superintendent L. C. Doty is working 40 men on company account. Here the main shaft is down 1,300 ft., with levels every 100 ft. The 500-ft. level has been run 3,000 ft., and at its end a shaft sunk 500 ft. and raised 300 ft. A 40-h.p. air-hoist placed in the tunnel station handles the rock from these eight levels by an ingenious arrangement of sheave wheels. The principal company work is confined to prospecting for copper.——At the Eagle and Blue Bell, Superintendent P. S. Williams is working on company account, shipping regularly.——The Little Chief is being worked by Joseph Hanophan, and the Tetro mine, under the superintendence of John Strong.——J. B. Evans has charge of underground work at the Snowflake.——There is but one mill in operation in Tintic district. This is the Uncle Sam at Knightville, near Eureka. Here the ore is crushed, classified and concentrated, the concentrates being shipped to the smelter. C. C. Griggs is superintendent of mine and mill.——Adjoining the Uncle Sam, the Godiva Mining Co. is building a new mill employing the Sherman system of water classification, which is expected to be ready by April 15.——At the May Day mine Superintendent H. M. Eakin is drifting on the 300 and 500-ft. levels from the 500-ft. shaft at the end of an 800-ft. tunnel. He has 30 men at work.——The Yankee Consolidated mine is being worked under the superintendence of B. N. Lehman, and the Beck tunnel by John Roundy.——At Mammoth, the working mines include the Ajax, Thomas Weir, president, and T. Patience, superintendent; the Lower Mammoth, Wm. Balls superintendent; the Mammoth, S. McIntyre superintendent; the Grand Central, C. E. Loose manager and P. Donnelly superintendent; the Black Jack, John Roundy superintendent; the Carisa, E. Hofman superintendent, and the Star Consolidated, J. P. Turner superintendent. A little work is being done near Silver City on the Swansea and South Swansea under the direction of S. C. Ware and Roan Wheeler, respectively. The Dragon iron mine, above Silver City, is being worked under the direction of L. E. Riter.

Eureka, March 12.

Salt Lake County.

The Bingham Metals Co. will instal a compressor at its mine in Pine canyon, near Bingham.

Summit County.

The Magnolia-St. Louis Mining Co. will instal a hoisting plant at its mines, near Park City.

Tooele County.

The Stockton Gold Mining Co. reports a strike of galena on the 850 ft. level on the Black Bear contact, near Stockton. Work will be resumed on the 500, 600 and 700-ft. levels.——In the Delmonte ground of the Scranton, near Delmonte, a new 1500-ft. tunnel is to be run to tap the Delmonte orebodies. The development of this portion of the property will be entirely through this tunnel.——H. J. Heermans, of Scranton, Pa., is now at the Scranton mine, near Delmonte, installing the engines and machinery recently purchased by the company.——C. W. Clark, of the Overland Gold Mining Co., has deeded to D. Blanchard, of Boston, the Sundown group of fourteen claims, in Tooele and Utah counties, together with machinery, tools, etc.

WASHINGTON.

King County.

A stamp-mill and concentrating plant for the instruction of students in metallurgy will be in working order on the campus of the University of Washington at Seattle within a month. Most of the work on the plant is being done by the students.

Kittitas County.

The Washington Quicksilver Co.'s mine near Ellensburg is ready for machinery and will be developed in the near future. The ore will be treated on the property by a 50-ton plant driven by electricity.

Okanogan County.

Development on the Leadville property near Loomis will be started soon.——Development will be started by the Copper World Co. on its property near Loomis.——It is reported that the Last Chance mine, formerly the Ruby mine, in Ruby district near Ruby, will be worked during the spring and summer. Ore shoots are being opened up by tunnels.——The Arlington mine near Ruby, will be equipped with machinery during the spring. The workings will be extended 300 ft. deeper.

Snohomish County.

M. Nisel, one of the refiners at the Everett smelter, who was arrested charged with stealing bullion last week, has confessed the theft and has revealed the hiding place where most of the stolen bullion was concealed.

Stevens County.

The British Columbia Copper Co. has installed a five-drill Rand compressor and a 50-h. p. boiler at the Napoleon mine at Boyd's, near Marcus. The ore from the mine is being shipped to the company's smelters in British Columbia.

The Hibernian Gold and Mining Co. will resume operations on two claims in the Pierre Lake district, 130 miles north of Spokane and near Hughes siding.——The American Flag Mining Co. will resume work on April 1, at the American Flag and Knob Hill mines one and one quarter miles from Rock Cut on Kettle River.

Whatcom County.

It is given out at Bellingham that the Copper-Lead Smelting Co. has temporarily abandoned the building of a smelter near that place, owing to its failure to secure a suitable site.

FOREIGN.

CANADA.

Consul Harvey, of Fort Erie, says that Canada is producing more nickel than all the rest of the world. The opening of Canadian nickel mining was the result of a $2,500,000 Cleveland concern starting mines in 1886 at Copper Cliff for copper. This was sent to New Jersey reduction works, where the nickel was run off in the slag as worthless. Soon after it was discovered that the nickel in the ore was valuable, and the ore now contains 12 lb. per ton, worth 40c. per pound—$4.80; 2½% copper, 50 lb. per ton, worth 15c. per pound, $7.50; 40% iron, and 30% sulphur. The International Nickel Co. now owns 20,000 acres of nickel lands, including the original Cleveland company's, and produces 700 tons of nickel matte daily, which goes to New Jersey refineries. Their output amounts to over $1,000,000 annually. There are also other mines in the Lake Superior region.

The preliminary report of the Geological Survey of Canada shows the mineral production of the Dominion during 1905 to have been $63,574,707, as compared with $60,073,897 during 1904. The largest items for 1905 were the output of gold, totaling $14,486,833; of coal, $17,658,615; of nickel, $7,550,520; and of copper, $7,420,451. The gold production of the Yukon shows a decrease of $2,172,800, and the gold from elsewhere an increase of $197,116. Copper increased $2,117,875; lead, $1,016,683; nickel, $3,331,373; silver, $1,558,862; coal, $1,066,384; portland cement, $625,748.

BRITISH COLUMBIA.

The mineral production of British Columbia during ten years, 1896–1905, is of interest to the mining industry:

Year.	Total Value.
1896	$ 7,567,950
1897	10,135,268
1898	10,667,561
1899	12,335,131
1900	16,314,751
1901	20,000,580
1902	17,486,550
1903	17,495,594
1904	18,977,359
1905 (estimated)	21,203,000
Total for ten years	$152,857,250

The production during 1905 was as follows:

Gold	$ 5,780,000
Silver	2,015,000
Copper	5,430,000
Lead	2,268,000
Zinc	320,000
Total metalliferous	$15,913,000
Coal	3,330,000
Coke	1,210,000
Building materials, etc	750,000
Total non-metalliferous	$5,290,000
Summary—	
Metalliferous	$15,913,000
Non-metalliferous	5,290,000
Total production	$21,203,000

Boundary District.

Estimates show the following numbers of men to be employed in the mines: Granby mines, 425; Mother Lode, 130; Brooklyn-Stemwinder, 150; Rawhide, 20; Sunset, 25; Emma, 25; Oro Denoro, 25; Pathfinder, 20; Betts & Hesperus, 5; Jewel, 5; Providence, 35; Skylark, 18; Last Chance, 8; Elkhorn, 5; Helen-Strathmore, 15; Prince Henry, 5; Preston, 5; Sally, 15; Rambler, 5; Washington-Idaho, 5; North Fork mines, about 25; West Fork mines, about 25; various small properties, about 50; total, 1,046.

At the smelters as follows: Granby smelter, 350; British Columbia Copper company's smelter, 100; Dominion Copper company's smelter, 150; total, 600.

The Boundary mines for the week ending March 10 shipped as follows: Granby mines to Granby smelter, 18,268 tons; Mother Lode to British Columbia Copper Co. smelter, 3,488 tons; Brooklyn-Stemwinder to Dominion smelter, 3,926 tons; Rawhide to Dominion smelter, 233 tons; Sunset to Dominion smelter, 970 tons; Mountain Rose to Dominion smelter, 206 tons; Emma to Nelson and British Columbia Copper Co. smelters, 375 tons; Oro Denoro to Granby and Dominion smelters, 462 tons; Providence to Trail smelter, 30 tons; Skylark, 40 tons; total for the week, 27,998 tons; total shipments for the year, 240,289 tons. The three district smelters this week treated the following tonnage: Granby smelter, 17,176 tons; British Columbia Copper Co. smelter, 4,525 tons; Dominion smelter, 5,514; total for the week, 27,215 tons; total treatment tonnage for the year to date, 247,418 tons.

G. H. Collins and W. T. Hunter have taken a working bond on the Washington and Idaho claims, on the west fork of Kettle river, near Phœnix.——At the Granby smelter furnace No. 6 is being changed and the management will try the experiment of placing the down-take pipe in front instead of at the rear of the furnace. The new tramway for conveying converter slag was completed and put in operation last week.——A 20-h.p. electric hoist has been ordered for the Prince Henry mine, near Greenwood. The shaft, down 140 ft., will be continued 150 ft. farther.——T. T. Muller, of the Chicago & British Columbia Mining Co., will resume operations on the Don Pedro mine, two and one-half miles from Phœnix.——Work began last week on a number of improvements at the Skylark mine, near Phœnix. These include a new shaft-house, 150-ton ore bins and a dry room.——The work of deepening the main shaft at the Mother Lode mine, near Phœnix, began last week. The owners of the Elkhorn mine, near Phœnix, will sink 100 ft. farther.——Five air-drills are now being operated at the Rawhide mine, near Phœnix.

Yale District.

A company of New Zealand men has leased three miles of the bed of the Fraser river, below Yale, on which they will build a large dredge. Manager Williams will have charge of the construction of the dredge.

FRANCE.

A dispatch from Paris, on the 10th inst., contained the following: An explosion of fire damp at 7 o'clock this morning carried death and destruction throughout the network of coal mines centered in Courrieres and fire followed the explosion, making rescue difficult and almost impossible. The excitement and confusion in the vicinity prevented early estimates of the exact loss of life, but a dispatch received here at 4 p. m. gave 1,404 miners entombed and probably lost. Later dispatches give more than 1,200 dead.

MEXICO.

Senor Manuel Diaz Barriga, of the Financial Agency of the Mexican Government, has made the following statements concerning the results of the new mining laws of Mexico: The taxes that were raised directly upon the production of precious metals were as follows: (1) The internal stamp tax, which represented 3% on the value of gold and silver; (2) the coinage tax, which was equivalent to 2% on the value of gold and silver; (3) the assay, smelting, separating and refining taxes, according to various tariffs; (4) the title to mines tax, which consisted of a payment of $10 per pertenencia; (5) the local taxes on precious metals, the maximum of which was 2% on the value of the said metals. In accordance with the new legislation, these taxes and dues have been subject to the following modifications: (1) The internal stamp tax has been fixed at 3½, 2½ and 1½%, according to whether the metals were in their natural state, or had been treated, or had been treated and refined; (2) the coinage tax has been abolished; (3) the title to mines tax has been reduced from $10 to $5 per pertenencia; (4) the annual tax has also been reduced from $10 to $6 per pertenencia, and in some instances to $3; (5) finally, the local taxes cannot exceed in future 1½%, and this reduction of 25% signifies a diminution equal to the respective Federal tax. The Executive, desiring further to relieve the mining industry, freed from import duties the principal articles, coming from abroad, used in the mines or for the treatment of metals, although some of these exemptions are only of a temporary character. According to calculations made as regards the production of the last fiscal year, the reductions of the taxes and dues that have been decreed will cause a sacrifice to the Federal budget of close to $4,000,000 annually. This loss may be distributed in the following manner: Calculating on a production of gold and silver of $105,000,000 (of which $10,000,000 will pay 3½%, $80,000,000 2½%, and $15,000,000 1½%), the stamp tax will produce less than it produced in 1903-4 by $575,000; the amortization tax abolished, $1,550,000; the reduction of the title tax, $300,000; the reduction of the annual tax on pertenencias, $725,000; the reduction of the Federal tax on the local taxes that are raised on mining, $200,000. Calculating what the Government will lose by the abolishing of the import duties on certain articles used by the mining industry at $250,000, the resulting total is $3,600,000.

Chihuahua.

W. K. Ryan has bought 250 pertenencias, at Los Plomosas, a zinc camp, six miles from San Sostenes station, on the Kansas City, Mexico & Orient Railroad. Large amounts of zinc ore have been shipped from the camp to smelters in the United States during the past 10 or 12 months.

Manuel Gameros is sinking a new shaft on the Juarez mine, in Santa Eulalia. It is down 118 m. and will be continued to 200 meters.

Leopoldo Iwonsky, manager of the House of Stallforth, in Parral, reports the sale of the Descubridora & Raya mines of J. F. Johnston and Bert Peterson, in the Buena Vista section of Santa Barbara camp. The purchasers are W. B. Thompson and associates, of New York. Mr. Peterson is retained as general manager. The purchasing company has also taken over W. V. Pettit's mill, on his Adela mine, near the properties purchased. This mill is to be remodeled and enlarged, and the process changed from amalgamation to cyanidation.

Thompson and associates have taken an option on La Paz mine, adjoining the Raya & Descubridora.

At Ocampo, a strike is reported in the Watterson mine of the Watterson Gold Mining Co., in the lower tunnel, where an 18-in. streak was cut, which runs over $500 Mexican per ton and the entire six feet runs $100 per ton.

A. B. Fall, of El Paso, manager of the Greene interests in Chihuahua, states that W. C. Greene has bought for the Gold-Silver Co. the Santa Eduwiges mine in Ocampo district from Governor Enrique C. Creel and Ketelsen & Degetau, of Chihuahua City. This is an old gold-silver mine, which was worked at one time by H. A. W. Tabor, of Denver.

Guanajuato.

C. W. Van Law, general manager of the Guanajuato Reduction & Mines Co., has gone to Mexico City to take legal action in the fight against the agents of the MacArthur-Forrest people. It is stated that the Guanajuato Consolidated Mining & Milling Co., the Peregrina Mining & Milling Co. and the Guanajuato Amalgamated Gold Mines Co. will join with the Guanajuato Reduction & Mines Co. It is understood that the Guanajuato Consolidated Co. has been operating its cyanide plant for more than a year without the authorization of the MacArthur-Forrest people.

Jalisco.

The San Rafael mines at Tapalpa have been transferred to the San Rafael Mining Co., of Mercer, Pa. The latter company has contracted for new equipment at the mine and is figuring upon the installation of a 50-ton reduction plant.

Monterey.

The owners of the Higueras mine, between Monterey and Saltillo, will construct a railway from the mine to the National Railroad, a distance of four miles, and will put in cables and tramways for transportation of ores.

Oaxaca.

The Veronica group of gold and silver mines at Tavache has been sold to H. J. Beemer, of New York.

J. Prim and R. Wilson have bought the Santa Maria claims, near Zacualpan. Development work has been begun, a shaft and tunnel having been started.

San Luis Potosi.

An official report gives the yield of 137 mining properties, covering 7561 hectares of land in this State during the year 1905, as 88,018,014 kg. of ore, producing $3,323,152. These properties include gold, copper, silver and iron mines.

Sonora.

(Special Correspondence).—The Calera mine, of the Ohio-Mexican Mining Co., at Coborca, has completed a 100-ton smelter built by the Colorado Iron Works. They have blown in.—— The surveyors are in the field now laying out a railroad to Point Lobos on the coast of the Gulf of California. One of Prof. Grendell's party that was lost between here and the coast was finally found by fishermen on the coast, but was crazy. Four hands of white men are reported to have been found nailed to a tree with wooden spikes near the place where Grendell's party disappeared, but these are supposed to be those of two men from Yuma who disappeared two years ago. Grendell's party had not reached Tiburon island as was generally reported. They planned to prospect the coast and possibly to cross the ford which the Seri Indians use to reach Tiburon island at low tide. They disappeared 25 miles from Poso Coyote, a spring near the coast. It is generally supposed the Papago Indians killed the Grendell party.

Guaymas, March 10.

The Wisconsin-Mexican Mining Co. will start work at the Plomosa mill and mine, which have been shut down for some time. This property was formerly owned by Dr. Toussaint.—— R. Graham, who owns La Colorado gold property, at the same place, has organized a company which will take over the property and put up a 10-stamp mill.

E. D. Brigham, of the Banco del Oro mine, at Magdalena, reports that the new 120-stamp mill is completed. The mill will be operated by electric power from Magdalena.

The Llano de Oro Co. is putting a 50-stamp mill on its property near El Oro in the Altar district. It is given out that the company will spend in the neighborhood of $1,000,000 in improvements before beginning actual mining and milling.

SOUTH AMERICA.

CHILE.

Consul Winans, of Iquique, states that the Chilean nitrate producers' combination is off, the agreement expiring on March 31, when it was expected that it would be renewed for another five years, but some manufacturers are not willing to agree to their quota of output, though all agree that 2,000,000 tons is all that will be consumed this year. It was desired to restrict the production to this amount, while the production may otherwise run up to 2,400,000 tons. This would cause a drop in price in 1907, unless the consumption increases. During the first 10 months of 1905 the consumption of nitrate of soda was 1,584,000 tons, compared with 1,455,000 tons during the same period of 1904. The failure to renew the combination is considered a serious matter here, and the Chilean minister of interior has requested a conference with the manufacturers, in order to effect an agreement; but the producers are of the opinion that nothing could be done at such a conference, and will probably not accept the invitation.

Books Received.

Report of the Reclamation Service for 1903-04, with accompanying maps, issued by the United States Geological Survey. The work deals with the various projects in the several States, each being fully described and illustrated.

'The Lead and Zinc Deposits of Wisconsin,' is the title of Bulletin No. XIV of the Wisconsin Geological and Natural History Survey. The volume has been written by U. S. Grant, and deals in an interesting manner with the geology, the ore deposits, and the methods of mining and treatment. The report is accompanied by numerous topographical maps. Published at Madison, Wisconsin.

'Bulletin of the School of Mines,' Golden, Colo., for January, 1906, contains a number of interesting papers, among them being: Concrete Foundation Floors; Legitimate v. Illegitimate Mining; Practical Points on Mine Surveying; Methods of Precipitation in the Cyanide Process, and Tungsten in Colorado. The latter paper is one of the most valuable and complete papers on the subject that has been published.

'Steam Turbines' is the latest contribution to this important subject. This volume, by Carl C. Thomas, contains 286 pages, with numerous plates and illustrations. The author has devoted himself to the setting forth of the essential principles of steam turbines rather than to those features of purely scholarly interest. To those interested in steam turbines the work will prove of great interest and value. John Wiley & Sons, New York. Price, $3.50.

'The Miner's Manual' is the latest contribution to this class of literature. The title seems unfortunate, as it leads one to believe it to be a treatise on practical prospecting and mining, whereas it deals almost wholly with the mining law. In this field it fills to some extent a wish of the miner who desires an inexpensive work on the relation of the law to the miner. The book takes up the various subjects—discovery, location, title, posting notices, recording, etc., and then the miner's rights. There are numerous blank forms and also a glossary of mining terms. Price: Buckram, $2.50; in sheep, $3. The book will be sent by the MINING AND SCIENTIFIC PRESS upon receipt of the price. Lowman & Hanford Stationery & Printing Co., publishers, Seattle, Washington.

'Electric Power Transmission' is the title of a handsome volume on this important subject, by Louis Bell, Ph. D. This is the fourth edition of this valuable treatise, which in itself is a simple indication of the favor with which the book meets. The work deals with the elementary principles of power transmission, the general conditions under which it is accomplished, and the operation of both continuous and alternating currents. A chapter is devoted to the hydraulic development of electrical energy, as well as by other means, and much attention is given to the line, its construction, materials and methods of distribution. There are numerous valuable and accurate tables for the use of the electrical engineer in the volume, as well as many excellent illustrations. McGraw Publishing Co., New York City. Price, $4, net.

Obituary.

SAMUEL J. HENDY, president of the Joshua Hendy Machine Works of San Francisco, died at his home on Wednesday, the 14th inst., of heart failure, after a short illness. SAMUEL HENDY was one of the best known and most popular mining men of the West. He had grown up from boyhood in the business of which he finally became the head. He was prominent in politics and a member of the Masonic and Odd Fellows fraternities, a colonel on the Governor's staff, and for years treasurer of the California Miners' Association. He was born in South Carolina in 1855. He had an attractive personality and was always a genial companion, he will be greatly missed and mourned by a host of friends.

M. E. SMITH, well known in Colorado as a sampling works and smelter manager, died at Denver last week, aged 65 years.

Personal.

D. O. MILLS is in San Francisco.

PERCY L. FEARN is at Boise, Idaho.

THEODORE DWIGHT is at Guanajuato.

J. H. KINKEAD is at Goldfield, Nevada.

J. PARKE CHANNING is at Los Angeles.

G. H. NICHOLS is at El Transito, in Honduras.

W. F. FERRIER, of Rossland, is in San Francisco.

T. G. MADGWICK has returned to London from Baku.

JOHN HAYS HAMMOND is expected in San Francisco.

WILLIAM B. DEVEREUX is at Camden, South Carolina.

J. E. SPURR is examining the Sirena mine at Guanajuato.

H. L. WEBSTER has returned to London from West Africa.

ROY H. CLARKE is examining mines at Douglas, Arizona.

ARTHUR WINSLOW is in San Francisco on his way to Goldfield.

H. L. SLOSSON has returned to San Francisco from Goldfield.

JOHN H. LUCAS, recently on the Rand, has gone to Rhodesia.

ALEXANDER BURRELL, of Montana, is at Berkeley, California.

JOHN B. FARISH is in San Francisco, on his return from Mexico.

E. GYBBON SPILSBURY has returned to New York from London.

F. L. BOSQUI has moved his office to 633 Mills Bdg., San Francisco.

GORDON LAND, of Grants Pass, Oregon, is visiting San Francisco.

G. LAVAGNINO has returned from Pasadena, Cal., to Salt Lake City.

E. FLEMING L'ENGLE is visting New York from Prescott, Arizona.

CHARLES JANIN sailed from New York by the *St. Louis* on March 10.

H. DE C. RICHARDS has returned to San Francisco from Virginia City.

T. A. VARDEN, of Kennett, has been in Nevada county during the past week.

S. A. WORCESTER, of Cripple Creek, is at Leadville on professional business.

D. SHANKS is manager of the Almoloya Mining Co., near Chihuahua, Mexico.

W. MURDOCH WILEY has been on a visit to Zacatecas from Guanajuato, Mexico.

C. A. RANDALL is superintendent of the Davis group, 16 miles from Prescott, Arizona.

JOHN J. MCKINIRY, a mining man of Ward, Colorado, is in New York for a week.

GEORGE J. BANCROFT is examining mines in the Altar district, of Sonora, Mexico.

H. L. GROSSBAUCH is now assayer for the Eureka-Richmond Co., at Eureka, Nevada.

ARTHUR H. HALLORAN, of the MINING AND SCIENTIFIC PRESS, is at Butte City, Montana.

W. G. SCOTT, formerly at Bingham, is now with the Arizona Copper Co., at Morenci, Arizona.

FORBES RICKARD is at the head of an exploring party in the Yaqui River county, northern Mexico.

C. M. PERRY, of Boston, connected with the Newark Mining & Milling Co., Nevada, is at the Palace Hotel.

J. B. TYRRELL, formerly of Dawson, is at Quebec attending the meeting of the Canadian Mining Institute.

S. HERBERT WILLIAMS is managing director of the Shawmut Consolidated Copper Co. at Bingham, Utah.

ROBERT W. HUNT, of Chicago, has been elected president of the American Institute of Mining Engineers.

C. W. PURINGTON, who has been examining mining property near Wickenburg, Arizona, has returned to Denver.

A. E. KEABLES has resigned from the management of the Old Union Mining & Milling Co., at Breckenridge, Colorado.

F. W. ROYER, of Mexico City, and HARRY A. LEE, of Denver, have been examining mines in the Sta. Eulalia district, Chihuahua.

H. W. B. HOWARD has been appointed assistant secretary of the American Institute of Mining Engineers in succession to THEODORE DWIGHT.

E. C. CONNERY, of Minneapolis, visited the Continental mine, at Vulcan, Colorado, and subsequently visited Los Angeles and San Francisco.

NEWTON W. EMMENS has been appointed consulting engineer to the Tinworkers Gold Mining Co. (Ltd.), at Camborne, Lardeau district, British Columbia.

JAS. D. SCHUYLER, as consulting engineer, and GEO. S. BINCKLEY as chief engineer, are at Monterey, Mexico, constructing a system of water supply and drainage.

W. H. SHOCKLEY has purchased a large interest in the Shoshone Annex Mining Co., owning adjoining ground to the famous Montgomery-Shoshone mine lately bought by CHARLES M. SCHWAB.

Latest Market Reports.

SAN FRANCISCO, March 15, 1906.

ANGLO-AMERICAN SHARES.

London, March 15, 1906.

	£ s d		£ s d
Camp Bird	1 8 3	Oroville Dredging	0 18 9
El Oro	1 10 0	Stratton's Independence	0 7 3
Esperanza	4 6 10½	Tomboy	1 8 9
Dolores	1 18 6		

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. March 15, 1906.)

Amalgamated	$107¼	North Butte	$ 81⅛
Anaconda	268½	Old Dominion	45⅛
Bingham Copper	38½	Shannon	7⅛
Calumet & Hecla	685	Tennessee Copper	45¼
Daly West	14½	Tonopah-Nevada	18¼
Granby	12½	United Copper	68
Greene Consolidated	29	United States	54½
Nevada Con. Copper	19½	Utah Copper	31

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 40	Ophir	$5 50
Hale & Norcross	1 30	Potosi	0 12
Mexican	1 25	Savage	0 59
Exchequer	0 60	Yellow Jacket	0 11

[Tonopah and Goldfield.]

Belmont	$6 12½	Montana-Tonopah	$3 02½
Golden Anchor	1 35	Ohio-Tonopah	0 49
Jim Butler	1 77½	Red Top	1 97½
Jumbo	1 52½	Sandstorm	1 40
Kendall	0 86	Tonopah Ex	12 00
Midway	2 55	West End	2 90

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 63¼c. per fine ounce; San Francisco, 63⅜c.; London, 29½d. (standard ounce, 925 fine); Mexican dollars, 49@51c., San Francisco; 49½c., New York.

COPPER.—New York (by wire, average for week ending March 15), Lake, 18.50@18.75c; Electrolytic, 18.37; Casting, 18@18.25c. per pound. Mill copper plates, $21; bars, 21@24c. London: £80 spot per ton.

LEAD.—New York (by wire, average for week ending March 15), $5.35 per 100 lb; San Francisco, pig, 5.70@6.60c. per lb.; pipe 7¾c.; sheet, 8¾@9¾c.; London: £16 2s. 6d. ℔ long ton.

SPELTER.—New York (by wire, average for week ending March 15), $6.25@6.30 ℔ 100 lb.; London, £24 16s. 6d. ℔ ton; San Francisco, ton lots, 7c.; 100-lb lots, 7¾c.

TIN.—New York, pig, $36.40@36.50; bar tin, ℔ lb., 42½c.; pig, 39c. London, £166 15s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, nominal, $20@25 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$41.50, large lots; London, £7 7s 6d.; San Francisco, local, $39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 35@38c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 16c@17c; San Francisco, 1000-lb. lots, 16c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8½c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11¾c; 14 oz., 10@10½c; 12 oz., 9½@9¾c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2¼@2½c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¼@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6¼@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

COAL.—San Francisco, coast, yard prices to dealers: Wellington, $7.50; Seattle, $6.50; Coos Bay, $5.50; Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $14.00; Cannel, $8.50; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35; gray forge, $17.85; San Francisco, bar, 3½c. ℔ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.00 open hearth billets, $28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8½c.; less than 500 lb., per lb., 8½c.; in 25-lb. tin pails, ½c. ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ½c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8½c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17c; Astral, 17c; Star, 17c; Extra Star, 20c; Eocene, 19c; Elaine, 26c; Water White, in bulk, 10½c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24½c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 15½c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 65c; cs., 70c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 53c.; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 57c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—98@99% N. Y., $1.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

RED LEAD.—500 lb. and over at one purchase, ℔ lb., 8½c.; less than 500 lb., 8½c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., 90c.

URANIUM.—Oxide, ℔ lb., $3.40.

Commercial Paragraphs.

SYDNEY C. MYERS, representing G. W. MYERS, of the Chrome Steel Works, is in Mexico and Arizona and reports good business.

THE Bucyrus Co. of South Milwaukee, Wis., is building 61 steam shovels, three railroad wrecking cranes and one railroad pile driver for work at Panama.

THE Madison Lead & Land Co., of Fredericktown, Mo., has been making additions to its equipment in a No. 51, 10 by 12-in., double-cylinder, double-drum, link-motion hoisting engine, and two double deck slime tables, 18 ft. diam., furnished by the Allis-Chalmers Co., Milwaukee.

THE Bullock Electric Manufacturing Co., of Cincinnati, Ohio, have placed an order with the Electric Cable Co., 42 Broadway, New York, for the new insulating compound, voltax, for impregnating field and armature coils. It is cheaper than rubber insulation, and with the increase in the price of pure rubber this new material is coming into use.

THE Colorado Iron Works Co., of Denver, has the contract to furnish equipment for a modern copper matting plant for the New World Smelting Co., of which G. L. Tanzer, of Seattle, Washington, is president. The plant will be erected on the latter's property, near Gardiner, Montana. The Colorado Iron Works Co. is also supplying the Pahaquarry Copper Co., of Bangor, Pennsylvania, with two sets 40 by 16-in., and four sets 30 by 10-in. C. I. W. Standard rolls; 22 impact screens, 13 of the latter having distributors.

THE Utah Mining Machinery & Supply Co., of Salt Lake City, J. E. Galigher manager, report the following recent sales of 'Callow' equipment: To the Hecla Mining Co., Wallace, Idaho, two duplex Callow traveling belt screens; to the Bunker Hill & Sullivan Mining Co., Kellogg, Idaho, one duplex Callow traveling belt screen; to the Nevada Consolidated Mining Co., Ely, Nev., two duplex Callow traveling belt screens and sixty-eight 8-ft. Callow settling tanks; to the Boston & Montana Mining Co., Great Falls, Mont., six 8-ft. Callow settling tanks; to the Tombstone Consolidated Mining Co., Tombstone, Ariz., six 8-ft. Callow settling tanks.

Trade Treatises.

Bulletin No. 2, of the Fulton Iron Works of San Francisco, is devoted to a description of a California gold mine and milling plant, and to some of the specialties of their manufacture.

Bulletin 51-C of the Sullivan Machinery Co., Exchange Place, Chicago, describes the Sullivan 'plug' drill for quarrying and similar work. Specific instances are given of the work performed with this time-saving tool.

The Leyner Rock Terrier drill is fully described in Catalogue No. 8 of the J. George Leyner Engineering Works Co., of Denver. This is a one-man drill, which the manufacturers claim operates with a minimum amount of air, with a relatively great drilling capacity.

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SAN FRANCISCO, MARCH 24, 1906.

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EDITORIAL.

PROFESSIONAL MEN will join with us in thanking Mr. E. P. Mathewson for the comprehensive and authoritative reply which he has given, on another page of this issue, to the questions comparing blast furnace with reverberatory practice. Mr. Mathewson has had unique opportunities for such a comparison, being manager of the great Anaconda smelter. The publication of such information can do no one any harm and, obviously, it is of great value to earnest students of industrial metallurgy.

PRICES for copper at San Francisco do not vary much from those current at New York. Last year, when the metal was in demand by China, the price here was better than at New York; but the market is small and it is supplied by the refinery at Tacoma, which is able to ship its product by water. There is no other refinery west of Great Falls; even the great Washoe smelter, at Anaconda, sends its crude copper to be refined at Baltimore and Perth Amboy, in New Jersey. Nevertheless, as the Chinese demand for copper grows; and that from other countries in the Orient unable to get sufficient of the metal from Japan, the market at San Francisco should become of increasing importance.

THE article on recent progress in the Lake Superior copper region, by Mr. J. Parke Channing, records the first results of an important departure in milling practice. The substitution of rolls instead of steam-stamps is in keeping with the tendency of modern methods of concentration by water; indeed, we dare go so far as to say that as the cyanide annex increases in importance, and amalgamation becomes a smaller factor in the processes for treating gold and silver ores, the ordinary gravity stamp also is destined to make way for machines, which, while they do not permit of amalgamation, are better devices for pulverizing the ore preparatory to cyanidation.

Snowslides.

The series of snowslides which have brought devastation to a number of mines in southwestern Colorado represent an agency of destruction which is at work each spring, but with variable intensity. Of all evidences of Nature's power there is none so feared by the miner as this, "the awful avalanche." After the winter snows have fallen and, by successive thaws and frosts, have become packed, there comes, during the period marking the end of winter, a heavy snowfall which, settling and accumulating upon the hardened surface of the earlier precipitation, is ready to be launched down the steep slopes of the mountains with all the suddenness of a thunderbolt and all the confusing terrors of a whirlwind. A slight cause may disturb the uneasy equilibrium; even a mountaineer's foot-fall may cause a huge mass of snow to become detached. In the San Juan region of Colorado, where the mountain slopes are steep and but poorly protected by forests, there are more people killed each year from this cause than in Switzerland, although the man of leisure who risks his life climbing the Swiss heights usually receives more mention in the daily press than the miners and other humble individuals who lose their lives in the San Juan while going to and from their labor.

Ouray, Silverton, Telluride and Creede—all in the region formerly known as 'the silvery San Juan,' but now identified chiefly with profitable gold mining—are localities where snowslides are of yearly occurrence. One of the worst seasons in this regard was the spring of 1884, when a series of slides came down into the cañon of the Animas, below Silverton, so as to blockade the Rio Grande railroad to Durango. In 90 days only two provision trains managed to get through; for this was in the days before the rotary plough. Nowadays such prolonged interruption to traffic is unknown. In March, 1902, 18 men were killed at the Liberty Bell mine, above Telluride; the mill buildings were swept away and the tramway was severely injured. Since then the management of the Liberty Bell has built a V-shaped crib-work of solid timbers, filled with rock, in the path of the slide that did this damage; their foresight was rewarded during the present week, for the snow broke away as before, but the slide was divided by this obstacle and did comparatively little harm. The slide which smashed the Camp Bird mill is called the United States, because it annually descends in a ravine past an old mine of that name. Snowslides usually follow a line of destruction marked out by them in previous years, and indicated by the removal of trees, the presence of debris and the accumulation of piles of snow. The United States slide comes down a steep slope, it crosses the road to the mine, and descends into the valley traversed by the tramway, the towers of which are protected by a timber cribbing. The Camp Bird mill is a little over half a mile away and has never been visited by this slide. Above the mill are steep hillsides covered with pine, which were considered to indicate immunity from such danger. This year the mass of snow and the velocity of it were such as to carry the slide down the valley and over the edge of the hollow in which the mill stands, so that the vast body of snow dashed down the precipice and broke the mill building like an egg-shell. It was a similar supposed immunity from danger which caused the Liberty Bell catastrophe; for, of course, the buildings were erected at a spot confidently believed to be beyond the range of any slide.

These occurrences are often fatal to miners and prospectors, they are too sudden to be escaped even by the experienced. In the cemeteries at Telluride and Silverton are many large graves inclosing the remains of groups of unfortunate men who have been swept into eternity by the fearful avalanche. Such happenings have incited the hardy people of the region to many deeds of heroism; indeed, almost as many losses have occurred among rescue parties as among those first entombed. A pathway once made smooth by a slide is apt to be followed by a further descent of snow; a succession of slides will occur.

There is only one way to avoid the danger; for buildings, not to erect them at the foot of snowclad slopes; and for men, not to go abroad on the mountains just after a fresh snowfall, especially when it comes on top of a hardened surface. But even the greatest care is insufficient, as we have seen, and so long as the mountains raise their proud heads to heaven they will occasionally shed their white mantles so as to overwhelm the men who invade them in quest of gold.

An Interesting Prospectus.

Many absurd things are done in the name of mining, but unless they serve as a text for serious comment, we rarely make reference to them in these columns. The prospectus of the Cyanide Gold Mining Company, however, deserves notice. Starting with the statement of a fact, namely, the world-wide use of potassium cyanide for the recovery of gold, the writers of this document use a metallurgical name for a mining proposition because they possess "millions of tons" of ore suitable for cyanidation. The estimate is stated as thirty millions at one place and as 80,000,000 tons "by measurement" elsewhere in the prospectus. But to men of such large affairs, what does a million or two matter? The fact is "substantiated" by the sworn statement of a notary public, who has resided for several years in the neighborhood of the Homestake mine and is therefore a fit and proper person to certify as to the value of a mine in Oregon. This notary public concludes that "the properties of the Cyanide Gold Mining Company present a far better showing as a mining proposition than do the mining properties of the Homestake Mining Company (and every one that knows the Homestake properties knows that they are hard to beat)." The latter part of this assertion is probably true, the former is open to reasonable doubt. Several other sworn statements follow. Methinks these gentlemen do protest too much. Two of the affidavits are made by assayers, who quote altogether five assays on which the estimate of "millions of tons" is securely based. Then follows a comparison with the Alaska-Treadwell mine, it being emphasized that this famous mine has paid dividends of $7,485,000 on a capital of $5,000,000, while the capital of Cyanide Gold is only $500,000; therefore, of course, the shares of the latter are worth ten times as much. There can be no question of that.

Finally, that enthusiast on black sand, Dr. David T. Day, of the United States Geological Survey, is quoted in support of Cyanide Gold. Dr. Day is usually considered a clever man, but we doubt if he "has proven beyond a doubt that the black sands of the Pacific slope have a commercial value of $30 to $40 per ton." It is explained further that "only by accident did Dr. Day discover" the fact. This is rough on the learned Doctor, but it must be true, for the other

statements in this prospectus are also manifestly open to no suspicion of inaccuracy. The prospectus closes with a highly important assertion that "the immense deposits of cement gravel of the Cyanide Gold Mining Company contain about five per cent of black sand of a high grade, which carries rusty gold, platinum, rubies, garnets, zircon, monazite, rutile, titanic ore and magnetic iron, which makes the best quality of fine tool steel." Of course every schoolboy knows that potassium cyanide—the godfather of the company—is just the thing for the extraction of rubies, zircon and garnets from cement gravel, and we only regret one fact, and that is our misfortune in being unacquainted with the magnetic personality of the man who prepared these titanic statements.

The Fissure Vein.

There has been an interesting discussion of late, among geologists, as to the significance and utility of the term 'fissure vein,' and while apology has been made for that much abused, and often misunderstood, name, there has been more respect shown for it than might have been expected by anyone in touch with the trend of modern thought in that branch of geology allied to mining. Dr. R. W. Raymond holds that it is "a pity to break the continuity of technical literature by unnecessary killing of a familiar term," and he considers that by prefixing the adjective 'true' before 'fissure vein,' it becomes more useful by being made more definite. Mr. James F. Kemp, professor of geology, whose authority in such matters will not be questioned, states that whether we use 'fissure vein' or 'true fissure vein,' these terms mean a fault-fissure, because we cannot conceive of a fissure of the extent supposed without sufficient displacement to constitute a fault. Mr. J. E. Spurr, author of a well-known hand-book on mining geology, recognizes the existence of fissure veins, but confines his recognition of them to veins which have filled preexisting rifts, larger than cracks; and he does not recognize the popular attributes attached to the name, such as necessary deep-seated origin or necessary persistence in depth. Finally, Mr. Heinrich Ries, another authoritative writer on economic geology, defines the fissure vein as "a tabular mineral mass occupying or closely associated with a fracture or set of fractures in the enclosing rock, and formed either by filling of the fissures as well as pores in the country rock, or by replacement of the latter." The definitions are from *Economic Geology*.

We quote these expressions of opinion and expect that they will serve as an interesting subject for debate at many places within the sound of the whistle of a hoist or the laborious breathing of an air-compressor. The definition of fissure vein strikes at the very roots of our ideas of lode formation, for each man's interpretation will be colored by his notions of the manner in which ore deposits are formed. But we do not talk to ourselves, therefore the significance of a word in technical literature will be that given to it by those who read, no less than by those who write. We cannot precede each use of a term by a reiteration of our definition of it. 'Fissure vein' retains the significance given to it by the miners of the Hartz and of Cornwall, a hundred years ago, when geology was no more the science that goes by that name today than the old astrology is the astronomy of our time.

To this old term there still cling the ideas of theories now obsolete and you may take, and interpret the phrase as you will, the taint of those notions will cling round it still. A fissure was an open crack in the earth's crust, filled, according to Werner, from above; the Cornishman uses the word 'crevice' in place of fissure and he pronounces it like the French word *crevasse*, now largely restricted to the chasms made in the upper surface of a glacier. To him, and to other intelligent miners, a fissure or a crevice is a once yawning cavity now filled with ore; it originated by an earthquake shock or some other cataclysmic agent. Neither that comfortable word crustification nor that comprehensive term dynamic action, has served to fill the gaps in his own imagination of how these things happened. The use of 'fissure vein' by geologists links their ideas to his, by misunderstanding. It is interesting to hear professors and writers defining words in familiar use among miners, but their definitions never reach far enough to modify the meaning of words already accepted and deeply charged with a significance older than any standard text-book. There will be a failure to connect. Start a *new* term fairly on its career and it has a chance to retain its identity from the lecture room to the stope, but the words of the stope, once a part of the language, cannot be called upon to turn themselves inside out. The zebra can change his stripes more easily. 'Fissure vein' carries the meaning the miner has given to it for generations, and no symposium of geologists can change that.

Even the Judiciary, in those humorous performances known as mining lawsuits, has evolved a definition, specifically intended to be within the meaning of the acts of Congress. Justice Field has stated, in a memorable case, that "a fissure in the earth's crust, an opening in its rock and strata made by some force of nature, in which the mineral is deposited, would seem to be essential to the definition of a lode, in the judgment of geologists." Well, we have just quoted the latest scientific definitions, so let that go, but the remainder of his dictum is worth quoting because, although enunciated many years ago, it is continually being referred to in later litigation. He said: "To a practical miner the fissure and its walls are only of importance as indicating the boundaries within which he may look for and reasonably expect the ore he seeks. We are of opinion, therefore, that the term (fissure vein) as used in the acts of Congress is applicable to any zone or belt of mineralized rock lying within the boundaries clearly separating it from the neighboring rock." Such a definition includes everything from Dan to Beersheba, and affords glorious opportunity for claiming your neighbor's ore reserves.

Obviously, the only thing to do is to express modern ideas in terms that are unhampered by the baggage of discarded philosophies, not necessarily new words compounded of Greek and Latin, but English words not yet overworked in technology. Take 'fracture,' or 'rupture,' or 'break'; does the word 'fissure' as we use it today in mining mean—not by this man or that, but by general acceptance—much more than any of these? One man reads the word fault into fissure, another does not. One authority assumes the creation of an open cavity, another denies it. Well, can any break, rupture or fracture be said to have geologic existence until there has been movement of the two faces constituting their opposite sides? Until it becomes visible by reason of the disturbance of continuity, is it other than latent? It is conceivable that a rock pulled apart by tension may be fissured without vertical displacement of the opposing falls of the fissure, but such an occurrence does not come within the notion of continuity involved in a lode deposit; it may apply to a 'gash vein.' A fissure that is not a fault, no matter how slight the dislocation, has no existence in structural geology and is of no service whatever to that circulation of waters to which we impute the origin of ores. And if 'fissure vein' be a heritage from Von Cotta and De la Beche, authors who wrote on ore deposits before the geology of mining was out of its swaddling clothes, what shall be said of the 'true fissure vein,' which has been the catch-penny phrase of every irresponsible promoter from the year 1. The mere fact that Dr. Raymond, than whom no one could write with more authority, not only for ourselves but for those in Europe who read English technical literature—the mere fact that his dictum on the matter can only prove effective among a handful of men who already appreciate the harmlessness of the 'true' in modifying the misdirection of the 'fissure,' ought to suggest the impracticability of trying to re-christen a spurious infant, the bastard offspring of young science and blissful ignorance.

In conclusion, we quote from an advertisement appearing in the *Illustrated London News* of ten years ago; speaking of the Phœnix mine in New Zealand, it is said that: "It has been inspected and reported upon by several eminent engineers who have declared that the quartz lodes are true fissure veins, and in true fissure veins it is well known that there is no fear of giving out or not paying as depth is reached, the experience being that they get richer the farther they go down." A term that has been debased to such ignoble use is fit only for fakirs, spoofers and imposters; it has no place in scientific literature. It should be used charily even by mine promoters.

By the Way.

In a recent address before the University of Wyoming, Dr. Victor C. Alderson, president of the Colorado School of Mines, said: In scientific achievements the past century made more progress than all previous centuries combined. The latter half progressed more than the first half, while the last quarter was the most productive age for science that the world has ever seen. This may sound strange, but consider that it took 3,000 years to perfect the alphabet, and 450 years to mature the art of printing, yet 60 years have been sufficient to develop telegraphy, and it has only taken a few years to develop the application of the Roentgen rays and wireless telegraphy. Discoveries are made and applied more rapidly today than ever before. The discoveries of pure science have been marvelous, but not more marvelous than the manifold applications of these discoveries to the improvement and elevation of humanity. The reason for this is very simple, and is due to one simple fact. Of late our attention has been riveted upon war; the war in Africa, in Cuba, and in the Philippines. We may perhaps in a careless moment imagine that the war of armies is the only one of which account must be taken. But there is another warfare, bloodless to be sure, but quite as bitter, as relentless and as far-reaching in its effects as any war in Africa, Cuba, or the Philippines. I mean the unceasing contest for industrial supremacy. It is a war between classes of different nations, of different climes. The farmers of Russia, of India, and America, are all engaged in this ceaseless battle. It is a war of prices, a war for markets, for wealth, for industrial eminence. In these days business sagacity and ability must be re-enforced by the best educational and scientific opportunities. This is preeminently the age of the trained man; the untrained man is at a great disadvantage in trying to make a place for himself or to solve the problem of success. Superior education was once regarded as essential to the success of the professional man, but it was assumed that natural sagacity and alertness were sufficient capital for the business man. Under the conditions of modern life and the growing pressure of competition, it is now seen that special training is as necessary for men of affairs as for men of letters, law, or theology. Germany was the first nation to recognize this truth, and she has added to her already magnificent system of technical education high grade colleges of commerce. These are not what we know as commercial colleges, wherein the curriculum embraces penmanship, arithmetic, book-keeping, and the elementary routine of the counting room, but a high-grade college instruction, covering international law, economic history, tariffs, commercial geography, products, distribution, all the modern languages, aiming to fit men to take commanding positions in trade, in commerce, and in the consular service. The expansion of the United States will call for an increasing number of men so trained. Mr. James Bryce has noted that the average American regards himself as fit to occupy any office he can get. But surely the present tendency is strongly toward recognizing special training and special fitness for positions of trust. The coming generation should make careful note of this: the day of happy-go-lucky, adventurous fortune-hunting is past; the day of the specially trained man is here. Be prepared for your calling or you will invite failure. The world is not so wealthy of individual power, not so rich in intellectual might, that it can afford to neglect the opportunities of developing to full strength those seeds of power which frequently lie dormant and unsuspected among the young. Believe in culture! Believe in symmetrical development! But, above all, believe that the individual owes it to himself and to society to bring to full fruition those powers in which the individual excels! Too much emphasis is laid upon mere knowledge. The man who merely knows many facts is like the 'strong man' of the gymnasium. He is big, merely. The true physical athlete is no stronger than is consistent with grace, agility, and ease. The mental athlete is capable and successful not according to the number of facts he may command, but according to his habits of thought, the accuracy of his perceptions, and the development of his faculties. Failure to get on in the world is due not so much to lack of knowledge as lack of capacity to think, lack of zeal, of energy, of perseverance. More important than knowledge are well-trained ears and eyes and well-ordered physiques. With large numbers of men and women personal vigor and energy contribute very largely to their success, or its lack dooms them to failure.

The present is the golden age; we made a wise selection when we chose it—a selection excelled only by our young friends who choose to come a little later. Their problems will be different from ours. They will find that every calling is today demanding that its followers must be thoroughly trained. Careful and systematic training will supersede mere Chinese shrewdness in copying. Never have the unfit, the unskilled, the untrained been weeded out so relentlessly as they will be in the near future. The coming century will witness the greatest development of industrial forces that the world has ever seen.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

ANHYDRITE is calcium sulphate, but it is harder than gypsum.

AGRICULTURAL PATENTS have no extra-lateral mining rights.

BOTH placer and lode claims may be included in a single application for patent.

THE prospector should deceive no one—particularly himself, though often he does so.

CALCIUM occurs principally as carbonate or sulphate. It is never known to occur in nature uncombined.

THERE are millions of tons of low-grade ore in the dumps of the mines on the Comstock at Virginia City, Nevada.

THE miner's inch has been fixed by law in several States, notably California and Montana, at 1.5 cu. ft. per minute.

IN the case of re-location a new discovery is not necessary; but the notice must state that it is a re-location of the original.

THE origin of the Yosemite valley is in doubt. Some maintain it is of glacial origin; others that it is the result of block faulting.

RUTILE, a titanium oxide, is used principally to give a delicate yellow color to porcelain, and to tint false teeth bluish white.

A PROSPECTOR should banish all notions of how veins and formation should look, and take things as he finds them, investigating everything.

SOME of the early geological reports of the government—from 1860 to 1880—are to be found in second-hand bookstores and in most large public libraries.

THE twenty-first annual report of the United States Geological Survey, Part III, gives a comprehensive description of laccolites in the Black Hills of South Dakota.

OXIDATION of a vein or mineral deposit extends to a depth determined by conditions. This depth varies greatly in different districts and in mines in the same district.

THE most extensive deposits of uranium ores known to date are those in western Colorado and eastern Utah, in the La Sal mountains. The uranium bearing mineral is carnotite.

IT has been observed by scientists that a series of earthquakes is usually followed by a volcanic eruption. The active volcano may be near or distant from the region of disturbance.

IT is not the practice of hydraulic miners to clean up frequently, as it is an unnecessary expense. For this reason flumes should be securely anchored to protect them from floods.

A DIPPING NEEDLE may be used with success to locate deposits of magnetic iron, but the presence of magnetic bodies of either ore or metal, make the compass needle practically useless.

SULPHUR mixed with earthy matter occurs around the vents of many hot springs in California and Nevada. None of these deposits are at present being worked, so far as known to 'Concentrates.'

LIME is sometimes shipped long distances when a superior article can be made at home from limestone of the vicinity. A lime-kiln is one of the simplest and least expensive of things to build.

NO millman can afford to assume that he is saving all the values in his ore, or that he is doing the best that can be done until he proves by careful sampling and assay of tailing that such is the case.

ASSESSMENT WORK on unpatented claims done in this or any other year in excess of $100 counts nothing for the succeeding year. Wages paid a watchman cannot be considered as applying on assessment.

THE first essential of a legal mining location is a *bona fide* discovery. Next is the marking of the boundaries of the claim by cutting stakes or building monuments. Some States require further things as part of the act of location.

THE modern streams of California have cut channels as deep as 3,000 ft. below the ancient river beds, in some places, particularly the American river, near the eastern end of Forest Hill divide, and near Canada Hill, Bald Mountain and that section.

IF the ground at the bottom of the shaft crumbles, like rotten granite, the pump may be relieved of much of the grit by placing a coarse wire screen about the suction, in which the holes may be too large. Large amounts of grit cause the rubber valves to cut rapidly.

PROFESSIONAL PAPER NO. 38 of the United States Geological Survey, by J. M. Boutwell, gives a complete description of the mines of Bingham district, Utah. It may be obtained by addressing the Director of the United States Geological Survey, Washington, District of Columbia.

DAMS built across streams should be provided with a gateway at the lowest point through which the accumulated silt and sand may be occasionally washed away. If this be not done in time the area back of the dam will become completely filled with debris and the dam will have ceased to be of value.

THE discoveries which first attracted attention to the Cœur d'Alene district of Idaho were the placers on Pritchard creek, near Murray. Little mining for quartz gold was done in the district until lately. Now the gold-bearing veins are attracting attention, and new discoveries of importance are being announced.

THE earliest long-distance pumping plant in California known to 'Concentrates' was that from the Colorado river to the Paymaster mine, in San Diego county. This line was 17 miles long. It was in use about 1885, and was a success. Since that date pumping plants of this kind have been successfully installed in many places.

ALONG the foothills of California there is little if any sign of glaciation, but in the higher regions—6,000 ft. and upward—glaciated boulders and striations on exposed surfaces are numerous. Doubtless ice had much to do with the erosion of the higher altitudes, but if it affected the lower lands all trace of it has been effaced by subsequent milder climatic conditions.

IN the case of rotary mills, like the Bryan, Huntington, Chile and other mills, quicksilver should or should not be fed inside the mill, according to the result. If the mercury is not badly floured, it would probably be good practice to add the quicksilver inside the mills, but if it results in heavy loss due to flouring, all amalgamating should be done on the outside plates.

AT many copper mines the water from the workings is conducted through long series of boxes filled with scrap tin and old iron junk, on which the metallic copper in the water precipitates. Some abandoned copper mines from which the water flows yield enough copper in this way to make it an object to owners to provide the sluices and scrap iron for its collection. The cement-copper is dried, sacked and shipped to smelters. It usually runs about 60% copper.

A TANK connected with a mill to supply water to batteries or concentrating machinery must be provided with a device to control the inflow of water, in order that the head may be constant. This may be done by providing a cock on the inlet pipe, actuated by a float. As the water lowers the float opens the valve; as the tank fills the valve automatically shuts off the inflow, and the water is thereby maintained at the nearly constant head so essential in satisfactory concentration.

WHERE mining claims have been properly located, and in later years the monuments have disappeared, the owner may replace the old with new monuments, conforming to the original description. A new location is unnecessary. No matter how carefully the owner may survey the claims, or cause them to be surveyed, the United States Deputy Mineral Surveyor must also survey the claims prior to patent, except in the case of placers on surveyed government land, where the claims must conform to the legal subdivisions of the land. Two or more responsible persons, fully acquainted with the facts, may act as witnesses.

IN the case of a mining claim being located May 10, 1902, and no assessment work being done during 1903, the claim reverts to the public domain at midnight December 31, 1903. Any legal proceedings in 1905 looking to foreclosure of a mortgage given on the property in 1902 or 1903 would be of no moment. If the claim were not properly 'represented' as required by law, it reverts to the government and C. had a right to re-locate the claim as against A. B. and the Sheriff. If a claim holder could escape performing assessment work by mortgaging his claim there would be thousands of claims covered by mortgage, real or otherwise, and no assessment work need be done by those thus willing to evade the law. The assessment work must be done, even after application has been made for patent up to the time the money is received by the land office and receipt issued therefor.

SULPHURIC ACID is not suitable for flocculating pulp, in the operation of the cyanide process, and as far as known to 'Concentrates,' alum is not used for this purpose, though it is known to have a clarifying effect on solutions carrying slime. At Dale, Cal., the conditions are peculiar and lime is undoubtedly the best material to use for clearing solutions. About eight miles south of the hills in which the O. K. and other mines of the Dale district are situated, limestone occurs which could be used in making lime; also, at the mouth of the San Gorgonia Pass, near Whitewater station. Wood is also available at the latter place, and it might be advisable, for commercial reasons, to burn lime at Whitewater and haul to Dale. Possibly there may be other occurrences of limestone nearer to Dale than those mentioned. Thus far lime is the best precipitant known for settling slime, and the cheapest.

THE cost of obtaining a mining patent is difficult to arrive at arbitrarily, for the reason that the cost of the several items which make up the whole are not all definitely fixed by law. Under ordinary circumstances, $300 should cover the entire expense of patenting a single quartz claim of 20 acres, and about $250 for patent to a single 20-acre placer claim. The following are about the costs: United States Land Office fee, $10; office of Surveyor-General, $35, for stationery and office work, or $40 if a placer. An abstract of title must be supplied by the applicant, and the cost of this varies greatly, anywhere from $10 to $100 or more, according to circumstances. The cost of publication is not fixed, nor is the attorney's fees, and these also may vary greatly. The United States Land Office in California gives the following figures as being approximately the cost of patenting a quartz claim: Payment on land, 20 acres, at $5 per acre, $100; Surveyor-General—deposit, $35; publication notice, $25; affidavits, etc., $5; deputy surveyor, $40; Land Office fee, $10. Total, $220. To this add the attorneys' fees, abstract of title and incidental expense. The cost of a placer patent is about the same for a 20-acre claim.

THE territorial law of Arizona requires in locating a mining claim the following acts: From the time of locating of a mining claim the locator shall be allowed ninety days within which to do, or cause to be done, the following things: To cause to be recorded in the office of the county recorder of the county in which the claim is situated a copy of the location notice; to sink a discovery shaft in the claim to a depth of at least 10 ft. from the lowest part of the rim of the shaft at the surface, and deeper if necessary, until there is disclosed in said shaft mineral in place; to monument the claim on the ground so that its boundaries can be readily traced. The failure to do all these things, here enumerated, in the time and space specified, shall be construed an abandonment of the claim, and all right and claim thereto of the discoverer and locator shall be forfeited. Thus it is seen that the Arizona law is specific, and provides a penalty for neglect to perform any or all of the requirements of the territorial statute relating to the location of mining claims. As the law has never been passed upon by the Supreme Court of the United States, there is a possibility that a locator who had done the necessary work of development, but who had failed to stake and record the claim, might be able to retain his title to the claim. The courts have decided, however, that the States and territories have the right to enact additional legislation as to mines that is not in conflict with the Federal statutes.

FURMAN gives the following as an excellent method of assaying gold and silver in copper mattes, pig copper, and in ores carrying a high percentage of copper: One A. T. of material is introduced into a No. 5 beaker and 100 cc. of distilled water are added, stirring the mass with a glass rod; 50 cc. of nitric acid (sp. gr. 1.42) are added, and the solution is allowed to stand until the action of the acid has apparently ceased. Then 50 cc. more acid is added, and the solution is allowed to stand in a warm place until the red fumes are driven off; the solution is now diluted with distilled water to 500 cc. and allowed to stand for several hours. The solution is now filtered off through a rather heavy 4½-in. filter-paper, the water used in transferring the precipitate to the filter being usually sufficient to remove the copper and silver salts. To the clear solution normal sodium-chloride solution (1 cc. = 10 mgms. silver) is now added in slight excess. A large excess is to be avoided, as silver chloride is soluble in an excess of salt. The solution is stirred and 10 cc. of a saturated solution of lead acetate are added, with stirring of the solution. Then 2 cc. of sulphuric acid (one part acid to one part water) are added, and, after stirring, the solution is allowed to stand for a few hours. When the precipitate has settled the solution is filtered off and the precipitate is washed into the filter, finally washing the precipitate to remove copper salts. The filtrate should be perfectly clear. The filters are removed from the funnels, and, after wrapping them around the precipitates, are placed in 2½-in. scorifiers and dried by placing the scorifiers on a hot plate. When dry the papers are burned by placing the scorifiers in front of the muffle, the scorifiers finally being pushed back into the muffle to destroy all the carbon and sulphur. To scorifier, containing the gold residue and the silver-lead precipitate, is added 5 gm. of litharge, 15 to 20 gm. of test-lead and 1 gm. of borax glass. The charges are now scorified at a moderate temperature, and when the scorifications are finished are poured. The lead buttons, which should weigh from 6 to 8 gm. each, are cupelled so as to show feather litharge, and the gold-silver buttons are weighed. The buttons are then flattened and parted for gold in the usual manner. The assay is usually run in duplicate, and the two results should agree almost exactly. This method may also be used to advantage for the determination of gold and silver in base ores, as gray copper, arsenical sulphides, etc. The method may also be used for the assay of silver sulphides.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—The subject of the best shape for a shaft, which Mr. Burrows brought up in the MINING AND SCIENTIFIC PRESS of Feb. 24, seems to have been settled by American miners; for the use of the long, rectangular form is almost universal in our country. There are but few departures from this practice, the four-compartment square Red Jacket shaft of the Calumet & Hecla being the most notable in recent times. The Forman shaft on the Comstock was made in L form, three compartments being arranged in a long rectangle (about 5 by 4½ and 4½ and 6 ft. clear spaces) with a 6 by 7 ft. clear, pump-compartment across one end. That disposition was not a success in the constantly moving ground of the Comstock. There is no solid brace for the end of one long wall-plate which bears against the middle of a long plate in the pump-compartment. This is inherently an insecure installation, and the long, narrow form is probably the best for ground that is not so exceptionally firm as that of the Lake Superior trap rocks.

Mr. Burrows has encountered a situation that many another engineer working in Mexico will have to meet. He describes the rock as being extremely firm, as indeed it must be, if an old shaft, 320 ft. deep, is still "in almost perfect condition." Timbering in such a case may be reduced to a framework sufficient to carry the guides and pump-columns, but that in itself is no light duty in a shaft 2,300 ft. deep, which is to have an output of 1,000 tons per day. The mere form of the shaft cannot affect the size of the timbers used, which will be determined by the weights and speed of hoisting. The depth of shaft and output given mean considerable weights moved slowly or lighter weights with high speed, and either one requires strong framing. On account of the interest of this case, I trust that a friendly discussion will not be objected to.

First, I will remark that there is no question here of an L shaft except in the old part, and there the plate running across the center could be braced well enough. The proposal of the directors to cut out the entire end would utilize the whole of the present shaft, but the manager's proposal would utilize only 50 or 63% of the old shaft, according to the use or non-use of wall-plates. The manager proposes to sink a 5 by 16 ft. shaft below the existing 10 by 10 ft. shaft, but that would not give two 5 by 4 ft. compartments in the old shaft, even without wall-plates. One of them would be 4 by 4 ft. 8. in. without a wall-plate in the new part, and 4 by 4 ft. 4 in. with one. Of course the full size can be had by making the addition 7 ft. long instead of six feet.

The effort to reduce costs by cutting out some of the timbers, the wall-plates, does not seem practicable. The timbering of a shaft is composed of units that are dependent upon each other, and are knit together by the bracing against the walls. Every thrust upon a timber is met by a counter-brace on the other side. Especially must the timbers that carry the guides be well braced and also supported by posts. Otherwise they are likely to be torn out by the swiftly passing cage. This is particularly true when the timbers are so light as eight inches. I have known five sets to be demolished at one stroke. For this reason I doubt if any system of timbering which omits wall-plates can be considered trustworthy in a shaft of the depth and output given in this case. At 800 ft. per minute it will take six minutes for a round trip, or 20 trips an hour for two compartments, and for 20 hours hoisting the live load will be 2½ tons. This allowance leaves only four hours for errands, timbers, etc.; which is too little. This load and this speed cannot be maintained unless the timbering is very good. In the stable ground of this mine 8-in. sticks may answer, but they must be framed in the best manner.

These considerations lead me to prefer the directors' plan of enlargement by cutting out the whole width of the shaft, but the pump-compartment must have a cross-brace in line with the dividers in the hoist-ways. As the greatest width that can be obtained, with full timbering, in a 10-ft. shaft, is four feet for two clear spaces, I think that the length of each space should not be less than five feet, and the directors' plan will require a shaft of 17 ft. 8 in. length.

If it is considered that a system of 4½ or 5-ton skips will serve the mine adequately, the directors' plan might be reduced to four compartments, two 4 by 5 ft. hoists and two 4 by 6 pumps, in a shaft 13 ft. long.

It is evident that the question of timbering is the most important of those brought up, except, perhaps, the limitation of a shaft for such heavy work to three compartments. Undoubtedly 8 by 8 in. timbers are small for a shaft 10 ft. wide, however long, but it is hardly possible to put in 10-in. timbers, for they would leave open spaces only 3 ft. 9 in. wide, and the guides would come out of the narrow dimension.

The mines in the district from which Mr. Burrows writes are likely to be supplied liberally with water, and I consider that roomy pump-compartments are a necessity.

It is hard to bring Mexican ways into line with American ideas. A native friend of mine down there is sinking a shaft five feet square on a very important mine. He already has 100 gal. water per minute, merely as an earnest of greater favors to come.

New York, March 7. JOHN A. CHURCH.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir — I have read with interest Mr. Burrows' article which appeared recently under the above title. I believe that there is still something to be said on both sides of the controversy, and that some conditions not mentioned in the article should be taken into account before final decision is rendered.

Regarding the manager's proposal, I agree that the required capacity (1,000 tons per 24 hours) can be attained through two hoisting-compartments 4 by 5 ft. each from a mine whose total depth is 2,300 ft. By no means all of the ore at any time will come from the lowest level, and with six or eight-ton skips and loading-pockets at mine stations, 1,000 tons can easily be hoisted in two 8-hour working shifts. It would be necessary to handle timbers, if passed down these compartments, and possibly also men outside of these 8-hour shifts. If much timbering is necessary in the workings above 320 ft., it would be advantageous to install a special hoist for operating a timber cage in one corner of the old Mexican shaft not occupied by rock hoisting. In case the manager's proposal is adopted, I would modify it by making the 5 by 16-ft. cross-section continuous to the surface, which would mean cutting out the old Mexican shaft in the left-hand lower part (as shown in the illustration) for a depth of 320 ft. from the surface. This arrangement would allow of a man and timber hoist of limited size to be operated in the pump-compartment even though that compartment be partly occupied by steam, air and water lines, etc., and these pipes could be handled directly through their own compartment. This would, however, make the pump-compartment rather crowded and the pipe-lines would necessarily be huddled together on one side, making them inaccessible for repairs. If the shaft be made a couple of feet larger, this difficulty will, in a measure, be remedied. The shaft would then be 5 by 18 ft. instead of 5 by 16 ft., as the manager suggests. This timber-hoist arrangement in the pump-compartment is in successful use in this district in shafts 1,000 ft. and more in depth.

The question of a separate timber-hoist has been omitted from Mr. Burrows' discussion. He also fails to state the rock-handling appliances to be used in the shaft. These are important points in the determination of shaft-capacity. With a special timber-hoist as outlined above, the main hoist-ways can be used for handling rock exclusively, and the skips or cages need never be used in working hours by timbermen, bosses or miners — at any rate after the men are down for each shift.

Mr. Burrows does not mention the present or projected existence of neighboring shafts. An adjacent shaft in the same property would modify the conditions governing the shape and size of the shaft under discussion. He implies that there will be only one shaft in the mine.

The question of timbering is not worked out in any detail by Mr. Burrows in comparing the two "proposals." He states that very little timber is necessary except dividers. If this is the case, the dividers would not necessarily be larger in the cross-sections in the square than in the narrow shaft. The length per set with end-plates and without side-plates in the narrow shaft for a three-compartment arrangement, would be 20 ft.; the dividers for the large shaft (10 by 10 ft.) would be also 20 ft. per set. If end-plates are added in the large shaft, the length of timbers per set without wall-plates, would be increased to 40 ft.— twice that required in the small shaft.

It is obvious that with equal hoisting-area, that is, 100 sq. ft. in either case, the narrow shaft would consist of four compartments and would take, neglecting thickness of timbers, 65 ft. in all, linear, for a complete set of wall-plates, side-plates, and dividers; while the square or 10 by 10-ft. shaft would only take 60 ft. linear, for a complete set. It would be interesting to figure in detail the above timber considerations which I have sketched roughly.

I regard the pump and ladder-way as shown in the directors' proposal much larger than necessary, and think that it would be desirable in case of continuing the shaft 10 by 10 ft. size, to run both dividers clear across, as assumed in my discussion of timber above, thus making the shaft four-compartment instead of three-compartment. This arrangement would provide nicely for timber-hoist and man-way, too.

I can see no reason for ever enlarging the 10 by 10 shaft to a 10 by 16 size unless it is desired to greatly increase the tonnage over that stated. For a shaft of large capacity, 4 by 4½ ft., or thereabouts, is the smallest allowable size for a single compartment in which either a cage or a skip may be operated. In case three compartments of approximately equal size fulfil the requirements, a long and narrow shaft allows of this arrangement with less cross-sectional area than if the shaft were square, for in the latter case, the shaft, for practical working reasons and for strength of timbering, would properly be divided into four compartments. Of course, the square shaft, 10 by 10 ft., will have more space for breaking the ground, as is stated in Mr. Burrows' article, and it could be broken with deeper holes, but possibly the ground may be such that the 5 by 16-ft. shaft will break well enough, and the cross-section being 80 sq. ft. as against 100 in the square shaft, will make a great difference in the amount of 'muck' to be handled.

I would differ a little with Mr. Burrows' statement that "buckets will be filled and waiting" after a depth of 300 ft. is passed. He apparently assumes that in sinking, hoisting is done from the bottom of the shaft directly to the surface. It is, however, especially in sinking the lower lifts, more advantageous to bulkhead the shaft near the bottom and remove the dirt by an auxiliary hoist placed in the mine, using buckets from the bottom to this bulkhead level. Then the buckets are emptied into mine-cars and the cars are hoisted at the cager's convenience, perhaps after he has finished his hoisting from upper levels; or the shaft dirt can be directly dumped into skip-loading pockets above the bulkhead. By this well-known method of using a bulkhead in sinking, the distance for hoisting waste from the shaft is greatly lessened, and there are other advantages too well-known to require mention.

Mr. Burrows concludes with an appeal to the authority of eminent engineers where work has been done in other regions. I believe that local conditions so influence this shaft question that unless the local conditions in two places are first found similar, argument from authority is of little avail.

ALEXANDER FORSYTH.

Victor, Colorado, March 9, 1906.

AIR-HAMMER DRILLS.

The Editor:

Sir — In the experience meeting on air-hammer rock-drills, we rise to say a few words for this great saver. One of the first of the Hardsocg machines was used at the Melones mines after we had spent considerable time and money on one of our own, and our first impression of it was outlined in a letter to a friend, in March, 1904.

"Replying to your inquiry concerning the improved boulder air-drill: It is made by the Hardsocg Wonder Drill Company at Ottumwa, Iowa, in the corn fields. It is called the Little Wonder, and it is. In our rock it will drill to a depth of two feet as quickly as a 2½-in. common air-drill mounted on a tripod. The steel is ⅞ in. and the bit we use is 1¼-in. diam. The drill weighs 19 lb. The first one they sent us was made of cast steel, the handle being cast solid on the shell. The handle broke off by the jar in a very few minutes. We tied an old piece of rubber hose on for a handle and have been using it ever since, when we needed it to drill boulders in the stopes or at the chutes. They made for us one of forged steel, the handle forged on. This one has not broken. The secret of its superiority lies in its simplicity, which is made possible by not introducing a ratchet and rotating mechanism, which puts too much light material in action. In this drill an equivalent result is accomplished by using more air, and exhausting the air through a hole in the center of the bit, or drill-steel, which delivers the air at the bottom of the hole, instantly following every stroke; this blows out the cuttings, and jumps the bit slightly back from the bottom of the hole. We have drilled 45 ft. with it in five hours actual running; drilling holes from 6 to 18 in. deep. We have not yet tried it on a hole deeper than two feet. Of course, as the hole deepens, the drill loses efficiency, relative to an ordinary drill. The bit we are using is round, with six cutting edges, radiating from the center. This obviates the danger of a fitchered hole, or a three-cornered hole. The cutting edges are so close together that if the bit struck several times in the same place, it would break off the edges of rock between the cutting edges, and the hammer strikes so fast, doing its work by a great number of light blows, instead of a few heavy ones, that there is very little danger of a fitchered hole. The shank of the drill is hexagonal, and is loose in the chuck. The whole machine is swiveled by the runner, by a slight twist of the wrist, which tends to give the same result as mechanical rotation, as the bit is twisted with the machine, and the blows are so rapid that a half hundred are struck while a slow man is turning the machine half around.

"It happens to fit our conditions exactly for 'bull-dozing' or block-holing. It has the same effect on the runner as a galvanic battery, and ought to be good for rheumatism."

After trying one of the drills our friend wrote us that while the drill might be good for rheumatism there was some danger of its inducing St. Vitus dance! We might add that after Mr. Hardsocg and Mr. Shaw and others have divided, by the callipers, the discovery of this little drill for mining purposes, they may find, covered with dust in the attic, that a similar machine was in use 15 years ago in mines in

Germany, known as the Franke drill, weighing only 16 lb. and striking 6,000 blows per minute.

FRANK LANGFORD.

Melones, Cal., March 6, 1906.

BLAST FURNACE *vs.* REVERBERATORY.

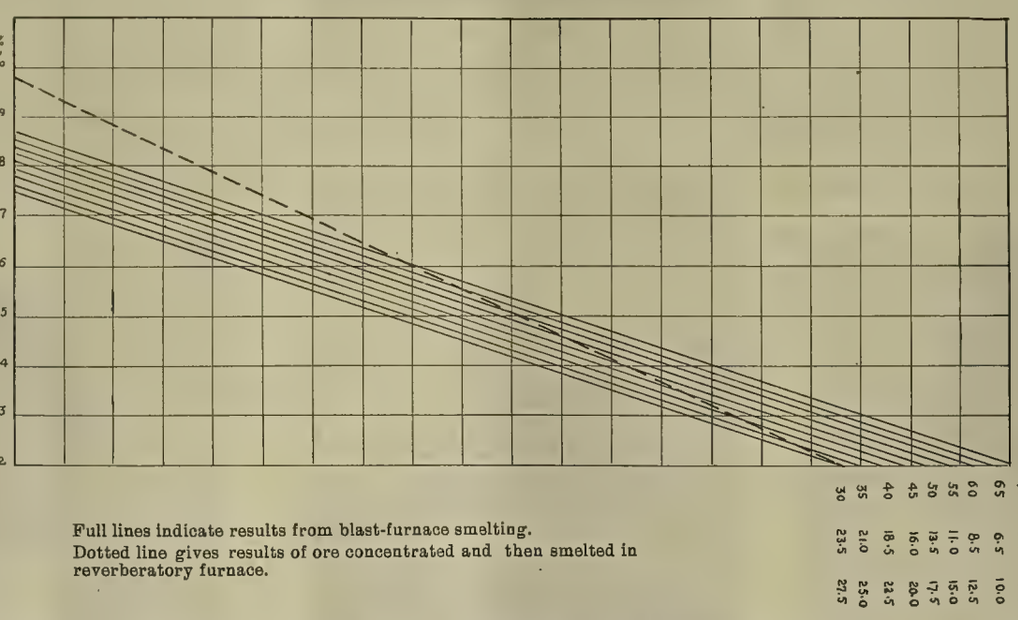
The Editor:

Sir—Referring to the questions on this subject, outlined by your correspondent, Mr. James W. Neill, I beg to offer the following:

(No. 1) *On what should the choice of furnace type be principally based? Character of the ore, fuel, fluxes, building materials?*

The choice of the furnace type should be based on (1st) the character of the ore to be treated, in its values in copper, silver and gold, and its analysis for silica, iron, lime, sulphur and alumina, particular attention being given to the amount of pyrite in the ore, which can be utilized as fuel; (2nd) fuel—the cost and character of the various fuels obtainable in the vicinity—for example, coal or oil for reverberatories and coke for blast furnaces; (3rd) the cost of fluxes, including the cost of iron ore or limerock delivered at the plant; (4th) building materials—cost of silica and fire-brick, the labor of bricklayers as compared with the labor of iron workers, and the cost of iron work; (5th) losses in slags—the loss in blast-furnace slags to be compared with the loss in tailing at a concentrator added to the loss in reverberatory slag, it being assumed that there will be no loss in roasting if the proper chambers are constructed to recover the flue-dust.

Attached is a chart showing the net values, with the product sold in New York, of an average silicious ore of the Butte district. This ore runs from 30 to 70% silica; 3.5% iron calculated as oxide to 23% iron as oxide; 7 5% sulphur to 27.5% sulphur and from 2 to 10% copper, with corresponding values in silver and gold. The full lines are the net values of blast-smelted ore; the dotted line is the net value of the reverberatory-smelted ore. All costs and metal losses in the different processes are taken into consideration. The chart shows the best method of treating such ore. The 30% silica and 2% copper ore can be treated equally well by either method. A 5.1% copper ore should be concentrated when the percentage of silica is 60 or over.



Full lines indicate results from blast-furnace smelting.
Dotted line gives results of ore concentrated and then smelted in reverberatory furnace.

(No. 2) *What are the comparative costs per ton of daily capacity of each type of furnace? In the case of the reverberatory, this cost should include the expense of the necessary roasting plant.*

I think to the roasting plant should be added water concentration.

The cost of treating an ore in a blast furnace varies with the analysis of the ore treated; let us take, for comparison, an ore of the following analysis: Copper, 5%; silica, 70%; metallic iron, 9.6%; sulphur, 11.7%; the cost of making a matte from this ore, per ton of ore treated, will be in the following ratios:

Reverberatory smelting	1
Blast-furnace smelting	2.66

while the net value of the product from the same ore, sold in New York, would be

Reverberatory	1
Blast furnace	0.9

A reduction of the silica and an increase of the iron and sulphur in the ore would reduce the cost at the blast furnace, but would not make much change in reverberatory costs.

(No. 3) *What is the comparative space requirement for an equal tonnage?*

Omitting the space for storage-bins, shops, offices, etc., the blast-smelting method requires 40% of the space necessary for reverberatory smelting, with its necessary adjuncts, concentrating and roasting. The storage-bin space would depend entirely upon the amount of material the proprietor felt it necessary to keep in stock to provide against shortages due to failure of transportation facilities, etc.

(No. 4) *What is the comparative cost of mechanical equipment for equal tonnages?*

The cost of a mechanical equipment for a blast-furnace system is about 96% of that necessary for a reverberatory system. Under the heading of blast furnaces, we include power, blast furnaces, converter lining, converting and casting furnaces. Under the heading of reverberatory smelting, we include power, concentrating, mechanical roasting, reverberatory smelting, converter lining, converters and casting furnaces. The local tramming or cost of transfer of material between departments is not taken into consideration, as the relative position of the buildings and method of transportation will determine these factors.

(No. 5) *What are the comparative costs of power, labor, fuel, and repairs?*

Comparative costs for an equal tonnage, bringing the material from ore up to matte, are about as follows in this vicinity:

Power—reverberatory smelting, 50% of blast-furnace smelting. Operating labor—reverberatory smelting, 66% of blast method. Fuel—reverberatory smelting, 12% of blast method. Repairs, labor and material—reverberatory smelting, 167% of blast method.

(No. 6) *What are the comparative amounts of capital tied up in furnaces of each type, and how does this affect the cost per ton of daily capacity or of output?*

Locked-up values in metals—reverberatory smelting, 136% of blast smelting. Plant investment—reverberatory smelting, 123%. Total reverberatory smelting, 124% of blast smelting.

The locked-up values affect the cost per ton of output only to the extent of the interest on the money tied up. The plant investment affects the costs to the extent of the interest on the money tied up and the depreciation of the plant.

(No. 7) *What are the limiting necessities in the way of fuels for each type?*

For blast furnaces, coke should not run to exceed 25% ash, with corresponding fixed carbon, and should develop not less than 10,000 British thermal units.

For reverberatories of modern construction, coal with long flame is necessary, and this should develop at least 10,000 B. T. U. Oil is not available in this locality at present, and is not considered.

(No. 8) *What are the comparative losses in slag, dust or middle products?*

The loss in slag by blast furnace on ores of the Butte district will be a little higher than the corresponding loss by reverberatory furnaces, on account of the large amount of barren flux added to the ore to form a blast-furnace charge. This excess loss in slag, however, is more than counterbalanced by the loss in tailing by water concentration.

There should be little or no loss in middle products, if proper dust-chambers are provided, by either method.

(No. 9) *What are the defining limits of each type in regard to slag composition?*

For the ores of the Butte district I find that the economical limit of blast-furnace slag is reached when the lime is 33%, the average slag produced from the Butte ores being 40% silica, 23% iron oxide, 26% lime.

The reverberatory slags we do not care to run above 5% in lime. The average reverberatory slag here runs 38% silica, 43% iron oxide, 2.5% lime.

(No. 10) *How do these differences in slags figure out in financial margins per ton smelted?*

All the silica and iron in the slag produced in the Butte district is supplied from the ores themselves; all the lime must be purchased; limerock, however, is very cheap in this vicinity.

(No. 11) *What method of charging do you advocate for a copper furnace (assuming the atmosphere to be oxidizing)?*

I advocate mechanical charging by means of side-dumping cars for blast furnaces; reverberatory furnaces are preferably charged from hoppers set above the roof of the furnaces, to discharge through the furnace-roof, near the fire-box end.

(No. 12) *Would you bind, in some manner, all fine for use in the blast furnace? Incidentally, what are the difficulties of treating fine ore in the blast furnace?*

All fine for the blast furnace should be bound in some manner before charged; if slime is available, briquettes can be made cheaply and charged while still moist. This is the usual custom here. These briquettes usually consist of a mixture of slime, fine ore, a little fine concentrate to add fuel, and, in addition, whatever fine coke is recovered from the ashes of the reverberatory furnaces.

The difficulty with fine ore in blast-furnace smelting is mainly in the formation of crusts on the sides, together with the production of excessive quantities of flue-dust, which has to be re-handled. The fine ore also greatly reduces the output of the furnace; it is important to have as little mixture of fine and coarse in the charge as possible. The reverberatory is the proper place for the fine, unless no flux material is available at a reasonable price, also in a finely divided form.

In this district, on account of variation in the ore, the combination of reverberatory and blast-furnace practice has proved to be the most economical. This has given us abundant opportunity to study the relative merits of each system, and the notes given above indicate the results obtained in actual practice here.

E. P. MATHEWSON.

Anaconda, Montana, February 28, 1906.

AIR-HAMMER ROCK-DRILLS.

The Editor:

Sir—Having read the article by Mr. Edward A. Rix, which appeared in your issue of February 24, entitled 'Air-Hammer Rock-Drills,' I venture to believe that the readers of the MINING AND SCIENTIFIC PRESS will be interested to know the results of a study on rock-drills operating upon the air-hammer principle, but designed for heavy work.

Mr. Rix in his article treats mostly of small plug drillers and believes that they will take an active part in the mining of the future. I believe that just as these drills bid fair to be used entirely for light work, that rock-drills constructed upon similar principles will displace the heavy reciprocating drills for heavy work.

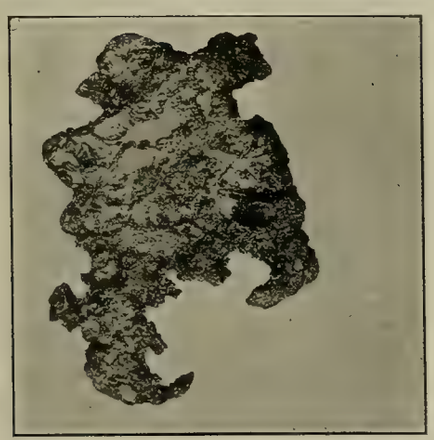
There are two drills, operating on the pneumatic-hammer principle, now on the market which have been designed to compete with heavy air-drills, that is those using a cylinder of from 3 to 3½ in. diam., and it is the merits of these two machines which I wish to discuss. One is the water-Leyner drill, which is operated by compressed air, and the other is the Box electric drill, operated by electricity. The analogy to the pneumatic hammer is more marked in the case of the compressed-air drill than with the electric drill, however; since, in the latter, the hammer is moved by the action of an enveloping reciprocating cylinder. The hammer is therefore drawn backward, due to the formation of a partial vacuum between it and the rear cylinder-head; upon the return stroke the rapid downward movement of the enveloping cylinder hurls the hammer against the end of the drill-steel with great force; the hammer in this case weighing 10 lb., acting through a stroke of four inches and striking 600 blows per minute.

We now come to the reasons for constructing rock-drills on the pneumatic-hammer principle. In the first place, it should be remembered that in this type alone is water successfully forced to the bottom of the hole. This is an important advantage, as it permits of washing away the crushed rock and allows a stream of cold water to play continually on the cutting edges of the drill-bit, thus preserving its temper and increasing its life. In the case of the reciprocating type of rock-drill there are no means of continually forcing water to the bottom of the hole; the drill-bit has, therefore, to be moved up and down through a heavy formation of mud, thus greatly retarding its speed and acting as a cushion for the blow, since all this mud has to be expelled from between the drill-bit and the bottom of the hole before the cutting edges can come in contact with the rock. Furthermore, the constant rubbing of the drill-bit against

the side of the hole wears away the gauge of the cutting edges rapidly. With the hammer-drill, on the contrary, the drill-bit always remains at the bottom of the hole, except for a slight rebound, and the gauge is consequently preserved for a longer period; the holes are more perfect and a marked saving is effected in the cost of sharpening the drill-steel. Furthermore, the constant reciprocation of the drill-steel in a hole filled with mud means that a large amount of power is used up in overcoming friction and in lifting the heavy drill-steel before each blow. As the hole becomes deeper, the weight to be lifted becomes greater and the friction is increased.

This tends to retard the speed of the drill and, as a matter of fact, a drill operating in a hole 15 or 20 ft. deep will seldom run more than two-thirds as fast as it would in a hole only four or five feet deep. This, in my opinion, explains the fact that the pneumatic-hammer type of drill will operate just as effectively as the reciprocating type for deep holes. The bit is always resting on the bottom; the forcing of water under considerable pressure, to the bottom of the hole, continually washes away the crushed rock which might tend to cushion the blow. Futhermore, there is no slowing up in the action of the drill when depths of 15 to 20 ft. are reached. This probably equalizes the slight loss due to part of the energy of the blow being dissipated in the form of heat or used up in compressing the end of the drill-steel, the greater part of the blow being transmitted the length of the steel due to the well-known power of resilience of metals. It might also be remembered that this type of drill strikes at least twice as many blows per minute as the reciprocating type and that this lead increases with the depth of the hole.

A special factor operating in favor of the Box electric drill is its ability to drill a straight hole and not be deflected from its course by seams or pockets. Deflection of the drill-bit causes it to stick or 'fitcher,' as the miners say, and leads to endless delay and trouble. It is particularly noticeable in



Native Copper as It Occurs in the Ore.

drilling through seams running in a line diagonal to the axis of the drill-hole. When the Box drill encounters such a condition, the drill-bit action is such that the cutting edges rebound but a small distance from the bottom of the hole and, being supported by a water-tube to within about three inches of the cutting edges, any sticking or 'fitchering' is prevented; even under the worst conditions but a slight deflection is produced. It is even possible to drill one hole at a very slight angle across another, giving but a slight deflection in the second hole.

And now a word in regard to the power required. It must be apparent to everyone who reads this article that the new type of drill can use but a small fraction of the power required to operate the reciprocating type. Furthermore, the amount of power always remains the same irrespective of the depth of the hole, since there are no heavy drill-steels to be lifted at each stroke and no friction to overcome except the friction in the drill itself. This permits of a reduction in the number of models which have to be manufactured, and which the user has to buy in order to have the proper sized drills for different classes of work. The size of the drill is governed more by the diameter of the hole, than by its depth. The manufacturers of the electric drill put out only two sizes, one for drilling small holes for stoping and 'plug' and 'feather' work, and the other to correspond with an air-drill with a three-inch piston.

It will be seen, therefore, that the new type of drill possesses advantages which the reciprocating type can never possess, owing to radical differences in design and breadth of application.

New York, March 6, 1906. W. R. HULBERT.

THE present annual diamond yield is between 400,000 and 600,000 carats, valued at about $30,000,000 to $50,000,000. The returns from the four De Beers mines are valued at about $25,000,000 yearly. The combined output of the diamond fields of Australia, Brazil, and British Guiana are insignificant in comparison with the South African yield.

Copper Mining on Lake Superior.

Written for the MINING AND SCIENTIFIC PRESS by J. PARKE CHANNING.

To one who has not visited the Lake Superior copper mines for several years, the two most notable things are the developments on the Baltic and Kearsarge lodes. On the Baltic lode, the Champion, Trimountain and the Baltic are each turning out about 2,000 tons of ore per day, or very nearly 2,000,000

Trimountain Mill.

tons per annum for the group. To the north of the Baltic, explorations are being conducted on that lode at the Atlantic, the Superior, and the Isle Royale mines, each by its own company, while at the

Tamarack No. 3 Shaft.
The Deepest Metal Mine in the World.

south end, the Copper Range Company, which controls the Champion, Trimountain and Baltic, has taken an option on Sections 1 and 2, T. 53 N., R. 35 W, this being part of the old Globe property

Champion Mine.

Here the Baltic lode was found some years ago by a diamond drill, and a shaft is now being sunk on the hanging-wall side. The drill-holes showed that the covering of drift was approximately 200 ft. deep with considerable water. To get through this 200 ft. of water-bearing drift is no easy matter, the first attempt by driving lathe behind steel sets being unsuccessful. Time was an object and so a timber drop-shaft was decided upon. This is now down about 117 ft., and progress has been satisfactory. The drop-shaft is made of Oregon timber 16 in. square, the outside dimensions being 16 ft. by 26 ft. The lowest side of timber has been chamfered so as to produce a cutting edge which has been protected by straps of iron. The water is being handled with one No. 9 pump, though a second one is held in reserve, and there seems no reason why a successful landing of the crib on the lode should not be made before the winter is over. This work is in charge of Mr. F. W. Denton, who is the manager of the Copper Range mines. He is now engaged in introducing the filling system in both the Champion and Trimountain mines, this being the same method of mining which has been so successful at the Baltic. It has been frequently described and consists of breaking all of the lode, no matter how wide, sorting it by hand, sending up about 60% of the material broken, and leaving the remaining 40% to act as filling. The backs or floors between the levels are taken out on a caving system somewhat similar to that used in the Kimberley diamond mines.

An extremely interesting experiment on a large scale is being carried out at the Champion mill on the shore of Lake Superior; it is an experiment which is likely to revolutionize the treatment of Lake Superior amygdaloid ore at least, and perhaps even that of conglomerate. The usual method of treating Lake Superior rock is to crush it at the mines to about a 6-in. size and then send it to the stamp-mill, where it is reduced by steam-stamps having a capacity of from 500 to 700 tons of ore per day, the material being discharged through a screen with ⅜-in. apertures. The coarse copper is taken out by an intermittent discharge at the bottom of the mortar, another portion of the coarse copper passes into the launder leading from the stamp, the balance of the material being screened. The oversize from the screen is jigged, the tailing thrown away and the middling re-ground and passed on with the under-size from the screen, which is then treated in the usual way with hydraulic classifiers, jigs, perhaps a second re-grinding, and a final finishing on Wilfley tables. In the experimental section of the Champion mill, the material as it comes from the mine is passed over a long screen, wetted down with water, and the feeder as usual picks out the coarse copper. Instead of going to a steam-stamp, however, it goes into a crusher and is brought down to about two-inch size. It then goes through a series of jigs, rolls and trommels which it is hardly necessary to describe, as the exact machines and their proper proportion have not been thoroughly decided upon. The screening, however, is carried down to one-quarter inch, after which any finer sizing is done with the old-fashioned hydraulic classifiers. Re-grinding is effected in a Huntington mill and the last fine material is passed over Wilfley tables. The steam-stamp, or in fact stamps of any kind, are, of course, entirely eliminated. In material carrying such small amounts of copper as the Lake Superior ore, the average assay-value of the amygdaloid being probably not over 1 5% copper, it is extremely difficult to make comparative tests and absolutely impossible to sample the original material. The relative efficiency of different methods can only be determined by sampling different tailings and even this is difficult. There is no doubt, however, that, in another three months, comparative figures will be available, which I hope Mr. Denton will communicate to the profession. In the meantime, inspection of the mill-unit in operation will convince the most skeptical that the method is a decided improvement upon the steam-stamps. One has but to look at two specimens, such as are shown in the accompanying illustrations, to realize that the rounded piece taken from a steam-stamp mortar was, in all probability, originally much of the same shape as its companion, which was taken from one of the coarse jigs. What has become of the angular parts? Undoubtedly they have been broken off and a large portion of them converted into slime of varying size. One has but to look at the Wilfley tables in that part of the mill using rolls and observe a narrow ribbon of cop-

Native Copper After Passing Under the Steam-Stamp.

per, say half an inch wide, and then go over to the stamp-section of the mill and see on the corresponding table a belt of copper from three inches to five inches wide, to realize the difference in the production of fine copper. So far everything indicates that the rolls section, new as it is and probably unbalanced, produces as good a saving as the stamp section, and of greater importance is the demonstration that the coal consumption per ton of rock is only one-half that of the stamp section. The space occupied is almost identical; in other words, the mill addition of four bays will accommodate two steam-stamps, each with a capacity of 600 tons of rock per day, or four roll sections, each treating at least 300 tons of rock per day. No figures of water consumption are yet available, but there is no reason why this should not be materially reduced over the stamping practice. It is admitted that for years and years the Lake Superior stamp-mills used altogether too much water. L. D. Ricketts has said of Arizona, that the very shortage of water in that arid country has been the cause of perfecting its concentrating methods.

At the Calumet & Hecla mill the water consumption has probably been reduced to the lowest of any plant on Lake Superior; it is one-half of what it was five years ago. There is some doubt expressed as to whether a roll-and-crusher treatment would be of great advantage on ore like the Calumet conglomerate, because of the intimate manner in which the copper is distributed through the rock and its extreme fineness. In fact, it may be said that it is impossible to crush Calumet conglomerate so as to free all of the contained copper, or as it is popularly expressed, in order to get copper out of the conglomerate it becomes necessary to slime it.

The exponents of the steam-stamp have not been idle, and the success of the Nordberg steeple-compound stamp at the Osceola mill is most pronounced. The old stamps were 20 by 24 in. and with steam at 110-lb. gauge pressure stamped 500 tons of rock per head per day. The new stamps are 15 and 24 by 32 in., and with steam at 150-lb. gauge pressure each head crushes 700 tons, an increase of 40% with the same coal consumption per head, or to express it in the terms usually used on the Lake, the tons of rock per ton of coal have been increased 40%. In the construction, the low-pressure cylinder is placed above the high pressure so as to facilitate the removal of pistons. The low-pressure cylinder is single-acting, its lower side being kept in constant communication with the condenser, no steam being admitted to the lower side. On the up stroke, when but little power is required, boiler steam is admitted to the lower side of the high-pressure cylinder, the upper side exhausting to the receiver and the upper side of the low-pressure cylinder as well as the lower side being in contact with the condenser. On the down stroke, when all the power is required, the upper side of the high-pressure cylinder is supplied with boiler steam, the lower side discharges into the receiver, and the upper side of the large low-pressure cylinder is supplied with steam from the receiver. This gives a very effective blow and accounts for the increase in capacity of the stamp, while using the same size of mortar and shoe. Diagrammatically, the strokes are as shown in the accompanying sketch.

On the Kearsarge lode, the Calumet & Hecla have two shafts at work. The Centennial, which for years endeavored to work its poor conglomerate and then tried to find a mine on the Osceola amygdaloid, has now two shafts on the Kearsarge, both of which are showing well. Next comes the South Kearsarge, belonging to the Osceola, then the Wolverine and then the North Kearsarge, also owned by the Osceola Company. Next beyond, the Allouez has sunk a shaft and encountered the Kearsarge amygdaloid, and after years of fruitless work on its conglomerate, will no doubt now be a paying proposition. Next comes the Ahmeek with two shafts, its surface plant now nearly reaching completion. Next the Mohawk, a well established property, is turning out a regular product and both north of the Mohawk and south of the Calumet & Hecla, the continuation of this wonderful persistent and productive Kearsarge amygdaloid is being traced.

Tamarack No. 3 shaft is now the deepest shaft in the world, being 5,128 ft. deep, and it is at this mine that some of the problems, which eventually will come up on the Rand, will be solved. The increase of temperature at Calumet is about 1° F. for every 225 ft. of descent, the normal temperature 50 ft. below surface being about 50° F. The above rate of increase would not make the bottom of the Tamarack much over 75° F. The temperature, however, in these workings, and also in the lowest workings of the Calumet & Hecla, probably is considerably higher than this, because of the heat evolved from the respiration of the men and the burning candles, while the humidity of the air makes it particularly uncomfortable to bear and to a large extent limits the efficiency of the miners. The problem of ventilation at these great depths, is yet to be solved. At present, nothing but natural ventilation is used, though in time great fans will unquestionably have to be installed, probably both plenum and exhaust at

Underground in the Champion.

the respective downcast and upcast shafts. Another question to be decided is whether to continue the vertical shafts down indefinitely and drive the cross-

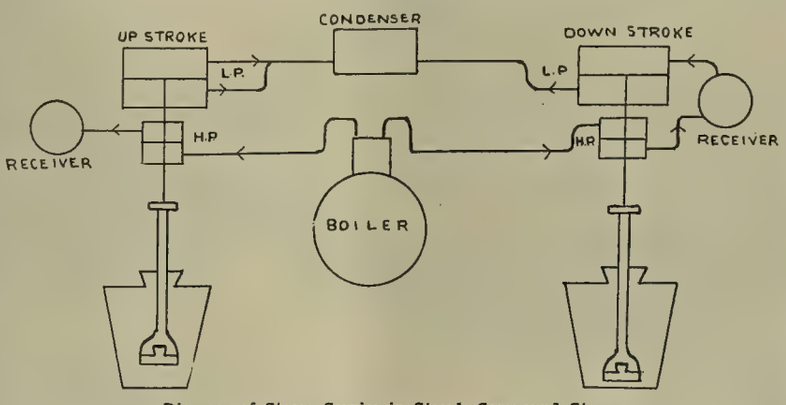
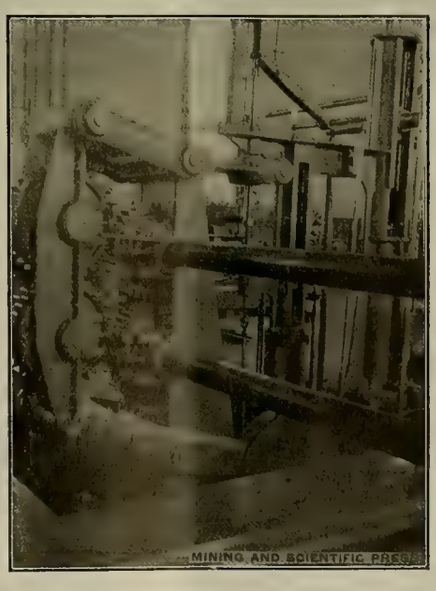


Diagram of Steam Service in Steeple-Compound Stamp.

cuts, which are getting longer and longer. This is a great hardship, as the conglomerate dips at an angle of 37°. The consensus of opinion among engi-



Reversing Gear of Nordberg Hoist.

neers is that slopes should be driven from the bottom of these shafts far enough back from the footwall of the conglomerate to make them safe, and that the hoisting should be done in two stages, one stage being the slope and the other the vertical shaft. The Calumet & Hecla are using this method in one place and are driving a slope due north under what is known as the Five Forties. As this slope is about half-way between the dip and the strike, it is of course very much flatter than anything which would be undertaken at the Tamarack.

The question of timbering, at both the Tamarack and the Calumet & Hecla, is also one of great importance on account of the rapidly increasing cost of timber. Experiments are being made with cast-iron columns and there is no doubt that some modification of the filling method, as used by Mr. Denton at the Baltic, will be tried at one or both of these mines. The conditions on the Calumet conglomerate are, however, exceptional, inasmuch as the first layers of the hanging-wall trap are extremely loose and blocky, and fall with the slightest provocation. Exactly how this loose ground is to be handled is a serious question yet to be solved. The Tamarack has already made a material saving in timber by driving its drifts to the boundary, where the stoping is begun, gradually retreating toward the crosscut. The slices are, however, taken one above the other so that by the time the floor of the level above is reached, a great deal of timber on the lower part of the stope needs strengthening. It is possible that a more close following of the 'long wall' retreating system, as is used in the North of England coal mines, might possibly be carried out in this work. No matter what method is followed, care must be taken to keep the proper air current in the face, and it seems quite probable that the study of coal mine conditions would aid in solving the problem of mining this comparatively narrow conglomerate at such great depths. Unquestionably the pioneer engineering work of deep mining has been done at the Calumet & Hecla and at the Tamarack, and that same spirit which has solved problems in the past can without doubt be trusted to solve them in the future. Upon Mr. James McNaughton at the Calumet & Hecla, and Mr. William J. Uren at the Tamarack, has the task devolved.

Conservation of Natural Wealth.—Marl or bog-lime beds which have been used as the base for cement factories have been produced in the past few thousand years, but the lake algæ and shells are still busy abstracting lime from the hard water. One thing which it would be interesting to know is how fast our marl beds are growing and how many acres of pond or bog and cubic yards of bog-lime a company would have to have so that when they got around they could begin over again. The State might well encourage such an investigation and also see how fast it could be accumulated by the fittest plants. In the same way with peat bogs. If peat comes to be a popular fuel, it will at first be mainly on accumulated peat that we shall draw; but it will also be worth while to know how fast a bog can be made to grow, and whether its growth can be stimulated by changes in water level or by encouraging appropriate plants. It is a good reason that scientific research be endowed on just this ground, that when the present coal mines are exhausted one may know where most readily to find new, and when these in turn are but hollow voids some inventor shall have found a storage battery that will turn Ariel from a tricksy sprite to a mighty genius of work and make the windmill as much a source of power as the water-wheel. Thus as earlier sources of power, lumber waste and coal are exhausted, one may turn to oil or gas, or use water power to develop electric heat or grow fuel either as four-foot wood or as peat, whichever shall be proved by scientific experiment to be the most economical. A Frenchman has recently suggested setting a coal mine on fire and pumping down just enough air to make water gas and then burning this gas as it comes to the surface. If this idea proves feasible it will add untold millions to the wealth of this State in seams which it will not now pay to burn. But in any case by the time our coal is gone we should be ready with our streams already dammed and copper cables covering the land to furnish more power from water than we now use from coal.—A. C. Lane in *Popular Science Monthly.*

One of the most extensive fields of onyx marble in Mexico lies along the border between the States of Durango and Coahuila. Beds of this marble have been found in the hummocks at the foot of the mountains which fall within the jurisdiction of the Hacienda Jimulco and on both sides of the Aguanaval river. The most important of these marble beds lies west of the Mexican Central Railway, being 20 km. from Peralta, at the foot of the high sierra on the way to Cuencame. The beds east of the railway lie in a similar position in the hills at the bottom of deep valleys. Some are in the Viboras ravine, while others are near Paso de Calvo ranch, 4 or 5 km. from Noria station. The proximity of the railway, the quantity and beauty of the marble, unite two facilities for making these beds of easy exploitation. They are not only extensive, but are important because of their accessibility. With few exceptions the quality of the Jimulco onyx is good from the surface.—*Mexican Herald.*

Destruction of Camp Bird Mill.

The daily press contains confused accounts of a big snowslide at the famous Camp Bird mill, 5½ miles from Ouray, Colorado. We have authoritative information that the snowslide carried away 50 stamps and 35 vanners, together with the covering of the entire 70-stamp mill.

But as if this were not bad enough, a fire broke out in the surviving part of the mill and in the absence of water, due to the destruction of the pipe-line, this was consumed, so that the whole 70-stamp mill and its accessories were destroyed. At least six months, and probably more, will be required to re-build the mill and resume production.

The Camp Bird mine is in Imogene basin, one of those semi-circular valleys frequently seen among the mountains of southwestern Colorado. The mine itself is at an altitude of 11,200 ft., or 1,840 ft. higher than the mill, with which it is connected by an aerial tramway 8,550 ft. long. The first accounts spoke of injury to the bunk-house at the mine, to the angle-station of the tramway, as well as the mill. If this be a fact, it is apparent that a series of slides must have occurred, but we are informed that the bunk-house was not seriously injured.

The bunk-house was built by Mr. Thomas F. Walsh, the former owner, and was one of the best in the country; Mr. Walsh always pursued the wise and humane policy of taking good care of his men. The tramway cost $55,094 and was an excellent example of this branch of engineering, while the mill, originally built in 1898, has undergone repeated addition and improvement since the transfer of the property to the English company, in 1902.

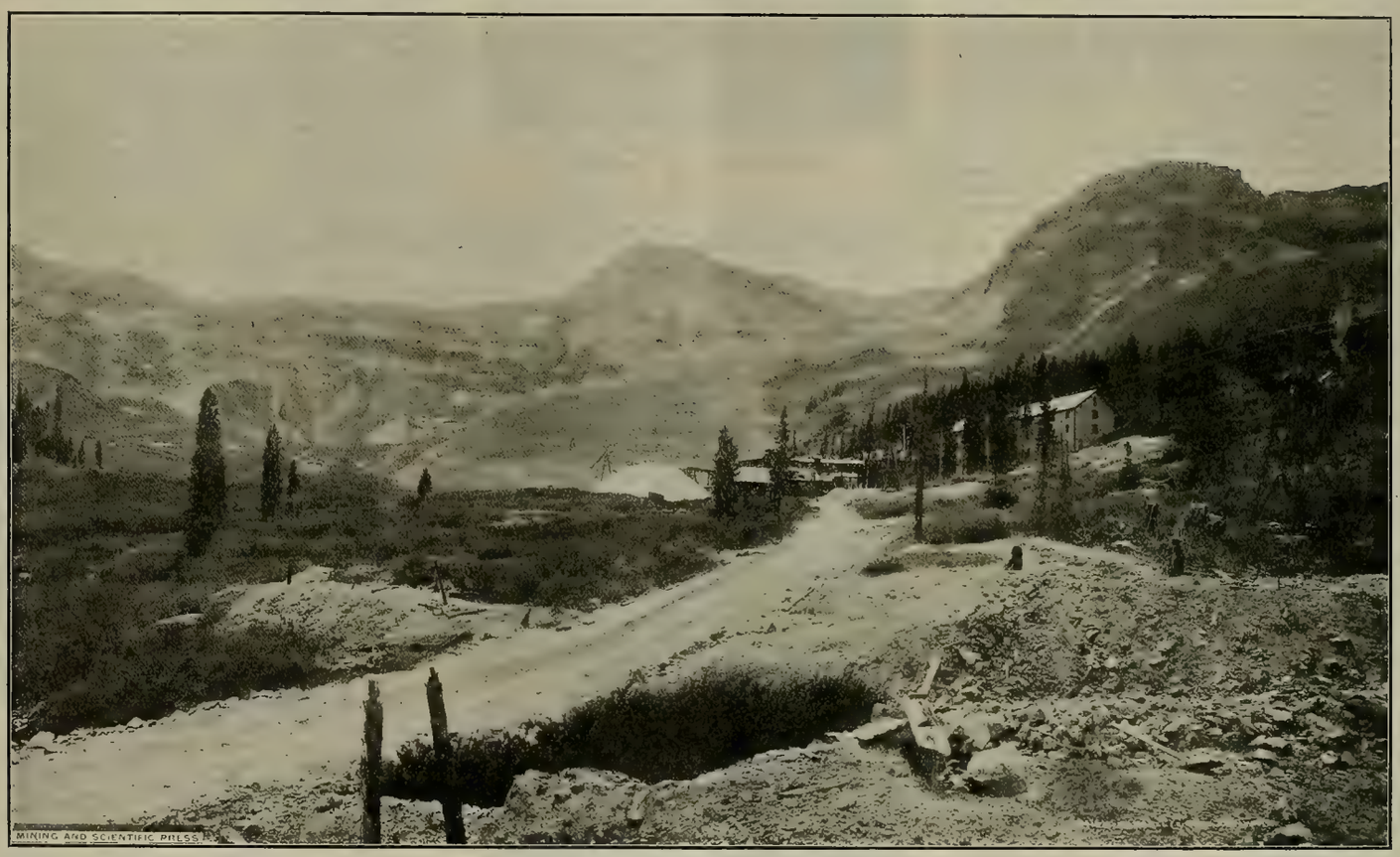
The Camp Bird is one of the great mines of America, and has done much to increase the reputation of Colorado as a profitable mining region. The following figures are eloquent:

Year ending April 30.....	Gross earnings.	Profit at the mine	Expended on construction account.....	Net value ore developed	Dividends paid.	Per cent.....
	$	$	$	$	£	
1903.....	1,976,289.68	1,293,007.42	77,438.88	3,113,604	164,000	20
1904.....	1,923,911.74	1,217,783.56	153,584.75	1,649,433	164,000	20
1905.....	2,342,361 45	1,656,301.54	79,507.75	1,836,872	225,500	27½
Totals for 3 Years..	6,242,562.87	4,167,092.52	310,531.38	6,599,909	553,500	67½

It was stated by Mr. John Hays Hammond, in the company's last annual report, that the reserves in the form of ore already broken would yield a profit of $2,600,000, while the ore blocked out showed an estimated net profit of $2,250,000. These two sums are nearly equal to the capital of the company.

The accompanying illustration shows the bunk-house and the tramway, together with the entrance to the upper mine workings. Owing to foreshortening, the mountains do not look as steep as they really are. Over the range to the right is Savage basin, where are the Tomboy and Japan mines, tributary to Telluride. Over the ridge at the back of the picture is the cañon that leads to Ouray, and on the further side of that cañon are the Yankee Girl, Guston and other celebrated mines.

The destructiveness of a snowslide must be seen to be appreciated; if at a distance, one hears the roar of its onset before the eye has caught sight of the cloud of snow that marks its fierce career; if near-by, all attempt to observe is abandoned in the effort to escape. But few persons have been caught in a snowslide and yet lived to relate their experience. The snow comes down like a torrent; if it is a 'ground' slide it uproots trees and carries rocks with it; if it is due to the descent of a new snow-fall on an older surface, it is less violent, but deadly enough. Men have been found dead whose heads and shoulders only were pinned under the snow, which congeals instantly into a solid mass; such slides are often mere masses of slush, heavy and wet. The dry snow gives a man a chance, for it carries air with it and permits him to battle for escape. The writer narrowly missed such a death when overwhelmed in a comparatively small slide at Riverside, between Ouray and Red Mountain. This spot—Riverside—was the scene each year of successive slides, and occasionally they would accumulate a mass of snow more than a hundred feet thick. This would not melt during the warm season, and one summer the four-horse coaches used to pass through a tunnel cut through the unmelted snows of the past winter. To a big slide, buildings and tramways are as the twigs that are snapped by a hurricane. On the heels of the descending avalanche there comes a whirlwind due to the vacuum caused by the rapid motion of the snow-mass and this cyclonic disturbance in the wake of the slide is frequently the cause of as much loss of life as the burial in the snow itself.



No. 1 and No. 2 Tunnels. No. 3 Tunnel, Tramway Terminal and Bunk-house.

The Camp Bird Mine, Colorado.

THE Lodon *Statist* publishes a remarkable table of last year's wages and expenses for white, Kaffir, and Chinese labor in the South African gold mines. The Rand output in 1905 is assumed as worth £20,802,074. It is then concluded that, as near as can be gauged, the £20,000,000 output may be split up as follows:

White wages: 25% of production	£5,000,000
Kaffir wages and food: 12½% of production	2,500,000
Chinese wages: 40,000 coolies at £2 per month, 5% of production, say	1,000,000
Stores (adjusted to producing mines): 27½% of production	5,500,000
Profits tax	425,000
Managerial expenses, head office, claim licenses, etc. (by difference)	575,000
Dividends earned and paid	5,000,000

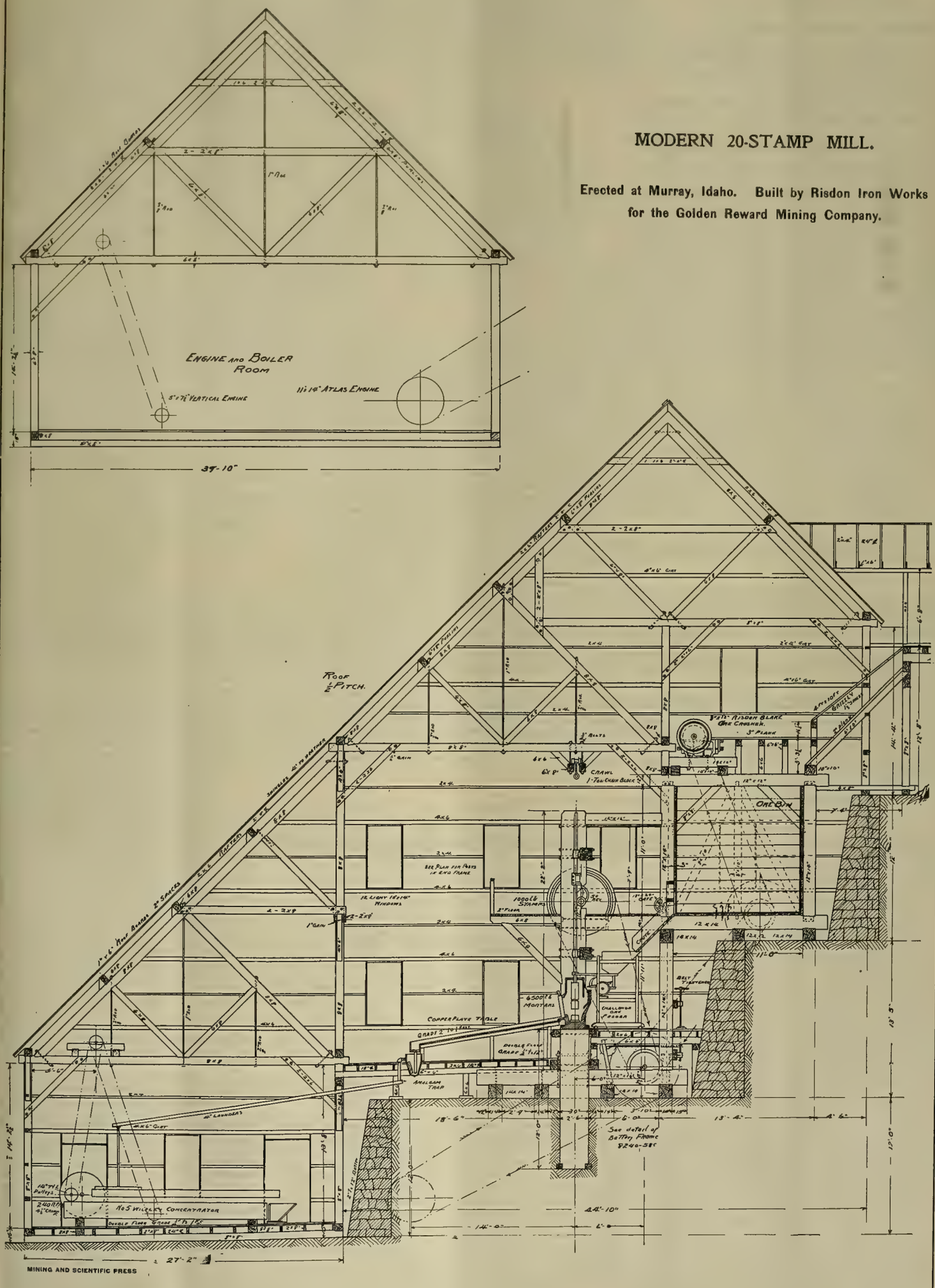
A Modern Stamp-Mill.

There is still a variety of ideas among mining men as to what constitutes the best type of construction for a stamp-mill. The designers of mills in their years of experience have gained a great deal of valuable information relative to effective construction, but it is true that they do not always embody in their mills that which they know from experience to be the best. The reason for this is that not infrequently the customer has some ideas of his own concerning the arrangement of the mill; these he wishes to be applied, whether they conform to the recommendations of the constructor or not. The result does not always redound to the credit of the man or the firm whose name is attached to the machinery. Occasionally the miner gives *carte blanche* to the builder, so that he can design after his own ideas, and the result is then likely to be a modern mill, of sensible and practical design. Such has been the result in the mill herewith illustrated. It was designed by T. R. Brooks, of the Risdon Iron Works, of San Francisco, for the Golden Reward Mining Company, of Murray, Idaho. The side elevation shows that the building is constructed so as to meet the heavy snowfall not unusual in that region, as indicated by the steep pitch of the roof and the ample bracing of the interior. Ore is delivered at the top of the mill upon a grizzly, the oversize going to the breaker sheet, and from there to the bins beneath. From the bins the ore passes automatically through the several stages of treatment until it reaches the tailing dump. Steam power is employed, the engine driving the line-shaft by means of two belts, running on two band-wheels attached to the crank-shaft of the engine. These are calculated to give a slightly higher efficiency and to make running more steady. There are separate engines for the concentrators and for the dynamo which supplies light for the premises. The arrangement of battery, the mortar-blocks and the sills are worth studying, for, although advancing nothing particularly new in mill construction, they are along practical lines, and an improvement on many we have seen elsewhere.

A BEARING METAL should have, according to R. C. Carpenter, a considerable adhesion to a lubricant and be readily wet by it; should be softer than the shaft, so that it will be injured instead of the shaft in case of grit in the bearing or a failure to maintain lubrication; should be hard enough to keep its shape under any loads that are likely to come on it; should have a melting temperature less than that of the journal, and should not adhere to the shaft when melted. For ordinary purposes, Prof. Carpenter recommends babbitt metal, but for more severe conditions he advises a mixture of 50% of aluminum, 25% of zinc and 25% of tin.

MODERN 20-STAMP MILL.

Erected at Murray, Idaho. Built by Risdon Iron Works for the Golden Reward Mining Company.



Mining and Milling at Ymir.

Written for the MINING AND SCIENTIFIC PRESS by D'ARCY WEATHERBE.

The town of Ymir is, by rail, about 15 miles south of the city of Nelson, British Columbia, and the Ymir mine is five miles, by wagon road, from the town. It is situated on the north fork of Wild Horse creek, near the junction, at an elevation of 5,000 ft. The scenery is wild and rugged, and in winter particularly picturesque, though the timber on the steep slopes of the Wild Horse ravine has been at some previous date destroyed by fire, so that only the dead and blackened stumps and logs of a once mighty forest remain. The formation in the neighborhood of the mine is assigned by the Canadian Geological Survey to the Nisconlith series of the Lower Cambrian, and the rocks consist of quartzites, altered argillites, and other slaty rocks. The stratification is distinct near the mine; the strike is northerly and southerly; the dip is generally at an angle of 60° northwest. Although the vein is persistent, the ore-body takes the form of a lens, which, at the crop, is 500 ft. long and 40 ft. at the widest part; it has a strike north 70° east and a dip of about 70° northwest. The vein-filling is quartz, containing gold and silver, the sulphides of lead and zinc, and calcite. A little iron and copper pyrite is also seen occasionally in the faces; the pyrite in larger quantities was characteristic of bonanza patches. Within the limits given, the ore varies so much at different points that

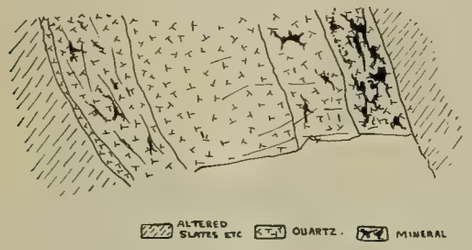


Fig. 2.

it is difficult to average the width. It has a distinctly banded structure and contains streaks and inclusions of country rock; it also displays clear evidence of secondary deposition. A good example of this action is seen at a point on the No. 10, or 1,000-ft., level, as explained by the accompanying sketch (Fig. 1). Here the main portion of the vein is a dull bluish white quartz. On the hanging wall is a streak of milky white quartz three inches wide and with a distinct slaty parting on both sides. Between this band and the first-mentioned quartz is an eight-inch width of interlacing stringers of the same character of milky quartz that lies on the hanging wall, enclosing angular inclusions of quartzite, but, what is most interesting, the stringers from this band extend toward the foot-wall *through the main portion of the vein*, and are evidently of later origin. The whole width of the vein at this point is 14 to 15 ft. Such evidence of banding, etc., may be found at other points in the mine, particularly at No. 7 level (Fig. 2), and it is generally found that the mineralization follows only certain bands. Dioritic dikes occur throughout the mine and in most cases appear to have a strong influence on the enrichment, those portions of the vein in the vicinity of the dike generally giving richer ore than elsewhere. As a rule, these dikes pass from one wall into the other, intersecting the vein, but not disturbing it physically. I noticed two exceptions to this rule, however, on the 1,000-ft. level (See Fig. 3). At a point about 115 ft. east of the entrance crosscut on this level, a dike may be observed in the hanging wall, and on meeting it, the vein appears to turn and follow it for a few feet before pinching out. It cannot be found on the foot-wall side and, so far as I observed, it does not intersect or disturb the vein in any way. All of these dikes cut the strata in strike and are generally vertically inclined. On the other hand, at the western end of this same level, a dike occurs interbedded and dipping with the strata and underlain by a quartz vein. It naturally crosses the vein obliquely, as does the bedding of the rock, and appears to cut it off abruptly. At the time of my visit, a crosscut on the under side of the dike was in progress to prove the foot-wall of the vein.

The mine was originally opened on top of the hill by a 'glory hole' 450 ft. long and ranging from 20 to 40 ft. in width. Shafts were then sunk and levels driven consecutively until a depth of 700 ft. from surface had been gained. At this depth the ore appeared to become poor. From a point in the hillside, 1,000 ft. below the crop, a crosscut over 2,000 ft. long was driven through the barren country rock to the vein, and the No. 10 or 1,000-ft. level was driven 800 ft. east of the crosscut and 345 ft. west, at which point the dike previously mentioned is encountered. The winze from the 700-ft. level was continued down the intervening 300 ft. to meet the 1,000-ft. level, but

Fig. 1.

with this exception the block between the 700-ft. level and the 1,000-ft. level is unexplored, though a raise is now being made through this ground.

The pay-ore has been stoped to a large extent above the 700-ft. level, the overhand method being used entirely, and the winze to the 1,000-ft. level is utilized as a chute, all the ore being trammed through the crosscut at the bottom. The widest portions of the vein itself do not necessarily all carry value, and great portions of it, consisting of 'bull quartz,' are left in the mine at many points. The mineral chiefly denoting value to the eye is galena, and as this contrasts with the white quartz so as to be readily seen, no system of sampling and assaying is employed. The ore is, to a large extent, free milling, an extraction of 77% of the gold and 44% of the silver being made in the mill. The mill-building is equipped with 80 stamps, but at present it is partly dismantled; 25 stamps are kept running, and of the 24 Frue vanners, 10 are in use. The stamps weigh 850 lb. and No. 9 and 11 slot screens are used in the mortars. From 2½ to 3 tons per stamp are crushed. The boiler-plant includes three 60-h.p. Robb-Mumford internally fired boilers and one return-tubular boiler of the same capacity. The engine-room contains one 200 h.p. Goldie & McCulloch engine, one 4-drill Rand compressor, one 10-drill Ingersoll compressor, and a dynamo for the electric lighting. A small water-power is available, but in winter it is only good for 15 stamps. The concentrate is shipped to the smelter and the tailing from the mill is carried by sluice to the cyanide-plant on Wild Horse creek. To prevent extreme wear, the sluices are arranged with drop-boxes, as in Fig. 4; they have riffles on the bottom. The plant and process have been fully described by Mr. E. C. Holden,* and with a few modifications they remain the same. The pulp from sluices is passed through two conical separators, which collect 73% of sand, 27% flowing away as slime. The slime is of slightly lower grade than the sand. Six steel tanks, each with a capacity of 210 tons, are used for leaching, the cycle being six days when running at full capacity. Centrifugal distributors placed over the center of each vat feed the pulp uniformly. When the mill is running at full capacity this takes about 30 hours.

Instead of the dry lime previously fed to the vats to counteract acidity, milk of lime is now used. The weak solution is then admitted (0.1% KCy), and then the strong solution (0.2% KCy). The pulp is then washed and the vats are discharged by hose and nozzle, the jet being under a pressure of 160 lb. per sq. in. The tailing is sampled by a water-wheel device and then by separators cutting out one part in sixty-four. Solutions pass from solution tanks to leaching vats and out to sump, from where they are pumped back to tanks and brought up to strength. The zinc used for precipitation is cut on the premises and the mud is cleaned up about once per month. It is roasted in pans to volatilize the zinc, as well as the white precipitate which forms, and is then treated by sulphuric acid to drive off the zinc remaining. From here it is placed in the filter-press to eliminate moisture, and the resultant cakes are smelted in the usual manner with flux to produce the bullion. The tailing is said to contain from 60c. to $1 when received at the plant, and the cost of production is given at 52c. by the Provincial Geologist of British Columbia, made up as follows:

COST OF TREATMENT PER TON.

Cyanide at 22c. per lb.	$0.200
Zinc at 9c. per lb.	0.020
Lime at 0.009c. per lb.	0.001
Fuel at $2.50 per cord.	0.019
Clean-up supplies.	0.029
Repairs	0.014
Miscellaneous	0.003
Labor (wages $3.50 and $4.50 per day)	0.234
Total	$0.520

Three men are employed besides the superintendent of the plant. The production at this mine from 1900 to 1904 is given by the same authority as follows:

1900—42,660 tons, yielding $7.20 gold and 1.06 oz. silver per ton.

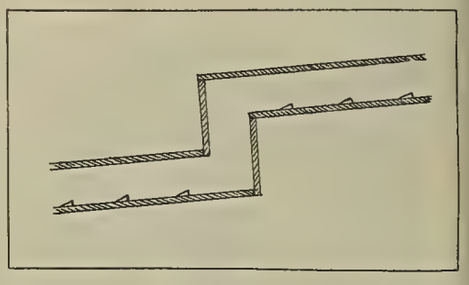


Fig. 4.

1902—About 50,000 tons, yielding $6.69 gold and $1.27 in silver.

1903—Some 54,000 tons, yielding 11,160 oz. gold, 5,060 oz. silver and 515 tons lead, with a total value of $300,000. In 1904 the output was not so great, being between 30,000 and 35,000 tons.

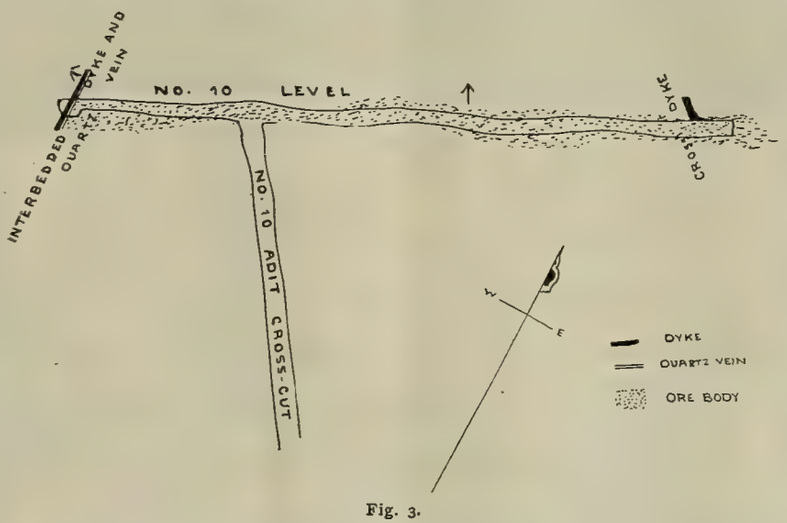


Fig. 3.

Transactions Amer. Inst. Min. Eng., Vol. XXXIV, pp. 599 to 608.

THERE is a well-known difficulty in determining the constant of a watt-hour meter connected with a variable line pressure. If the voltage between the mains is so nearly steady that it can be regarded as constant, the testing of a registering watt-hour meter on customer's premises is not a difficult operation. The usual plan, in this country, is for the tester to carry about with him a portable form of rheostat load, and either a standard wattmeter or a voltmeter and an ammeter. The time occupied in making a definite number of revolutions is carefully noted for the meter under test, when the known portable load is applied. A table then shows whether the meter is fast or slow. If, however, the voltage across the mains is very variable, and the range of variation is, say, from 5% above normal to 5% below, then the load on the meter with a constant rheostat in circuit will vary from about 10% above normal to 10% below, and it is difficult to assign the quantity of energy which has passed through the meter, within several per cent.

TUNGSTEN is mined in Arizona, Colorado, South Dakota and California. A vein four feet wide has been recently found near Cripple Creek. The concentrated ore is worth $100 to $250 per ton. The Troy-Manhattan Copper Co., at Troy, Ariz., mine and concentrate wulfenite, lead molybdate; the American Molybdenum Co., at Cooper, Me., has a concentrating plant. The concentrate is worth about $200 per ton. Much prospecting is being done. The output, in 1903, was 795 tons of concentrate. Uranium and vanadium are mined principally in Montrose county, Colorado, 432 tons of crude ore being mined in 1903, which was concentrated to 30 tons, and sold at $5,625. The ore is carnotite, containing only a small amount of uranium. Titanium is manufactured as ferro-titanium by the Willson-Aluminum Co., from titanic ore from Caldwell county, North Carolina. Illmenite and titanic iron are synonymous.

The Trouble at the Walker Mine.

Written for the MINING AND SCIENTIFIC PRESS by an Occasional Contributor.

The Walker mine was opened below the 300-ft. level by John Powers, superintendent, who for upward of three years contended with the problem as best he could. Now, the 600-ft. level was reached after many a weary struggle with inadequate pumps; often handicapped by lack of funds, skilled men and necessary material, he had the satisfaction of installing a powerful compound condensing duplex station pump, apparently adequate for a long time to come. For six months this pump had been within less than 100 miles of the mine, but snow, blizzards, mud and slush had combined to delay its arrival. For three months Powers had worked on, almost to desperation, suffering from a diseased foot that threatened his very life, so that when the new station pump began its leisurely work he laid down his duties and sought relief at the hands of a surgeon in a distant city.

The Walker company was controlled by a board of non-resident directors, which, like most such bodies, was divided against itself. Just prior to the departure of Powers, two of the directors, the minority, visited the mine, taking with them a young mining engineer named McNevin, a protege of theirs, who was duly installed as manager *ad interim*, with the assurance that he should continue in the employ of the company as consulting engineer if his services were satisfactory. McNevin was a graduate and carried a parchment that entitled him to all the respect and deference due to his profession, and, unfortunately for himself and the company, seemed to consider this as qualification enough. The instructions from Powers as to the care of the pump, the provision of 'sand sumps' at stated intervals as the work progressed, and other items pertaining to the general work of the mine, fell on deaf ears. He would sit in the hoist station and entertain himself and the engineers by recounting his accomplishments, and would build himself up in his letters to the company by criticising Powers and holding up his work in an unfavorable light, without a word as to the difficulties under which the work had been done.

As the drifting and crosscutting progressed there was an increase of water, necessitating higher speed for the pump. The pump took water from practically an open sump, at the intersection of the main crosscut and the first drift west. In making the turn from the drift to the crosscut a 'turn-sheet' was used. One day a car of fine dirt upset into the sump. Mac damned the old superintendent for the event and told everybody how *he* would have arranged things. In another day or two another carload of waste went in, resulting in more bad language and a report to the company voicing his disapproval of Powers' methods. Another day, and the third car followed; and then something happened. The sump was filled so that the end of the suction pipe was covered. By great exertion the dirt was partially cleaned out and the catastrophe of a flooded mine was averted for the time, all of which was duly reported to the company, giving in detail the wonderful energy of the writer and the slackness of the methods of the old superintendent; but still the sump remained open, thus inviting more trouble.

No sand sumps were provided as the work of drifting progressed, so all of the fine sand, due to blasting and an excess of water, was washed in. Faster and faster the pump was speeded to hold the water in check and the consumption of fuel increased in exact ratio. McNevin figured the capacity of the pump, multiplying the combined area of the pistons by the length and number of strokes and the volume of water being raised; it was tremendous, according to the figures, while to the practical eyes of the engineers and miners the stream discharged was not noticeably larger.

In the face of the crosscut the drills struck a flow of water that spouted with considerable force, but the situation being considered critical the holes were not fired, but were plugged with wood to keep back the water.

To the suggestion of the pumpman that the valves be examined Mac would not listen, but turned his attention to adding to his pumping capacity. The shaft was already equipped with a No. 9 sinker and a new No. 7 was borrowed from a neighboring mine and installed alongside. To make proper water connections, a line of 4-in. pipe was coupled and gradually let down the shaft as each section was screwed on. When about 200 ft. long, the great weight caused the single clamp that secured the sustaining cable to slip, and the whole line shot down to the bottom, some 200 ft. below. The new, borrowed No. 7 pump was hopelessly ruined and the No. 9 pipe-connection broken. No damage was done to the main steam-pipe but what a few moments would have repaired; but the golden moment passed in wild excitement. The water was rising rapidly, and then the qualities of the real leader developed in McNevin. He ordered the No. 9 pump raised to the 400-ft. level. Another pump, to replace the broken one, was secured and installed. From neighboring mines pipe was borrowed to replace that which was lost and damaged. To the office of the company came the report that the accident was caused by the breaking of the cable; that it was an old one which ought to have been thrown into the pit years before, and that he had now secured a new cable by borrowing, and had thrown out the old one; that had he not have taken prompt action the mine would have been flooded to the top; he had saved it at the 400-ft. level, and now, after ten days of awful hard work, the water was again being lowered. He paid a glowing tribute to the heroic work done by all hands, etc.

A telegram asking him who was in charge, and who was responsible for the accident, was promptly answered by saying "John Powers, superintendent." Finally, after a fortnight of great exertion and an inordinate consumption of fuel, the station pump was again reached and the valves examined, when it was found that both the valves and valve-seats were badly cut. The valves, hard rubber discs, were turned over and the pump again set to work. The excessive firing had over-heated the return arches that were under the boilers, causing the arch supports to warp enough to let some bricks fall out. Again the report scored Powers, as McNevin announced that it was not safe to let the men go into the mine, there being great danger of a fire in the boiler-house that would certainly smother all the men inside; so he had closed the mine and would do nothing except try and keep the water out, unless the board of directors would so order and relieve him of all responsibility, etc.

At this juncture the majority of the board acted, and sent out a thoroughly practical man to investigate, with full authority to act at his discretion. This man, whom we will call Jones, arrived at noon. A brief inspection of the boilers resulted in a call for men, and within a few hours the damage was all repaired, with everything as snug and safe as though all were new. The men were ordered by Jones to report for work on the next shift, and McNevin, after again formally declaring that the mines were not safe, left the camp, vowing dire vengeance, through his 'pull,' for this breach of professional courtesy.

Jones next turned his attention to the station pump, which was working very badly again. The sump was examined and no obstructions were found around the suction valve. A platform around the pump was built at once that effectually protected the sump, so that it would be impossible to fill it again with dirt from the car. The valves were opened and found to be as badly cut as before turning. There were no extra valves, none having ever been provided, so prompt action was needed, for one hour would cover the pump enough to prevent its work. Taking two or three valves and ordering the rest sent up as fast as possible, Jones went outside to devise some means of putting a new face on them, and accomplished this purpose by rubbing them on a red-hot iron until he had burned off enough to form a new, smooth surface. As fast as this was done they were sent in, and when he followed with the last valve all the rest were in place, and in a few moments the pump was started, with water nearly half way up on the low-pressure cylinders. The pump worked better and soon lowered the water.

New valves and valve-seats were ordered, but it was apparent that something must be done to insure safety during the 30 days that would probably elapse before the supplies came. Some sole-leather was secured and discs cut from that. The leather, being soft and thin, would not hold up against the pressure of water, so, to re-enforce them, the hard rubber valves were sawed in two, making each two discs about $\frac{5}{16}$ in. thick. One of these thin discs was placed over each leather, to give it the necessary strength, and the job was done.

The soft leather sucked down into the cut in the valve-seat, making an absolutely tight joint, and the strokes of the pump were reduced from 65 to 28 and the fuel from 10½ cords per day, to simply keep the mine unwatered, to 7½ cords, which not only handled the water, but ran two 3¼-in. machine drills and hoisted from 70 to 80 cars of rock.

The report to the company was a short statement of facts and the assurance that "as long as there were bulls on the range the pump would be kept going, and that it was ample to handle double the present volume of water." It is only to be added that the discredited cable lifted the No. 9 pump and, after being thoroughly inspected, it was replaced on the winch and is good for a long time to come.

This is written, first, as a statement of fact, and, second, to impress on the graduate the necessity of gaining actual experience before trying to build himself up by tearing down others who have come up by hard knocks. The educated young man has a far better chance in the race of life if he begins his active work with a clear conception of his ignorance of homely, practical details, and is alert to learn. For such there is room, and opportunity for abundant success.

THE Lake Superior iron region produced 20,198,311 tons in 1904 as compared to 7,682,548 tons in 1894. The most recently developed range, the Mesabi, took first place in 1895 and has since occupied that position. In 1904 it produced 11,672,405 tons of iron ore.

The Metric System.

The American people have a world-wide reputation for their ingenuity in devices to save time and labor. It is an anomaly that such a progressive people has failed to see the enormous loss of time and labor incurred in the retention of medieval and confusing weights and measures.

Three-fourths of the enormous foreign trade of the United States last year was with countries having the metric system—the system now in use among four hundred and fifty millions of people. Merchants import liquids by the liter, textiles by the meter, foods and drugs by the kilogram, and the innumerable consignments must be calculated into and sold by different measures of volume and of length and by avoirdupois weight and troy weight and apothecaries' weight. In exporting commodities, on the other hand, quantities, weights and measures must be laboriously converted into the terms of the metric countries to which they are shipped.

One may imagine the time and labor lost in these processes and the tendency to prevent the expansion of our commerce that these vexations must exert, for where other things are equal the four hundred and fifty millions of metric potential customers naturally incline to deal with those who speak the same trade language as themselves. The views of exporters and importers show how keenly they feel this handicap and how eager they are for the adoption of the simple, uniform and widely used system which would clear the existing obstructions from the pathway of commerce.

If we had no commercial relations whatever with foreign countries it would seem incongruous that the American people, while progressing in all other directions, should have failed to adopt such a unified and simple system as the metric for the facilitation of internal trade—and this is nearly 20 times as large as that done with other countries. The first step toward adopting the metric system was taken 40 years ago, when Congress passed the law legalizing it in contracts and court pleadings. Six years after that step was taken Germany adopted the metric system—and it has contributed not a little to the industrial and commercial growth at which the world marvels—while we are still weighing copper by one 'standard,' silver by another and drugs by a third, with other confusions 'too numerous to mention' in measures of volume and length.

We have been outstripped in the adoption of the metric system by Japan and by countries that the average American condescendingly regards as half civilized. The metric is taught in our schools, but the children must also learn the complicated systems that are retained in use, although a full year's time would be saved in their education if these were dropped. In electrical operations, in engineering, in pharmacy, in industries that demand nice measurements, like the manufacture of automobiles, and watchmaking, and in numerous other fields the metric system is in common use today. Why longer continue the confusion and the loss of time and labor and accuracy involved in retaining the obsolete weights and measures? Congress should awaken to the fact that this is the twentieth century and comply with the demand for adoption of the metric system.—*The Herald*, New York.

TIMBER PRESERVATIVES.—With the life of telephone and telegraph poles at its present limit, the 800,000 miles of existing lines, requiring 32,000,000 poles, must be renewed approximately four times before trees suitable to take their place can grow. A pole lasts in service about 12 years, on the average, but is made from a tree about 60 years old. In other words, to maintain a continuous supply, five times as many trees must be growing in the forest as there are poles in use. The severity of this drain upon forest resources by the telephone and telegraph companies is obvious enough. Since 1902 the Forest Service has been making a study of the preservative treatment of poles and of the value of the seasoning in relation to treatment. In this work its first object has been to make the timber last as long as possible, so as to check the annual demand for renewal, and thus lessen so far as possible the drain upon the forest. Seasoning was studied in the first place to determine the rate at which poles become air dry; that is, lose as much moisture as they will part with through evaporation in the open air. The time of cutting was also carefully considered. Experiment proved that poles cut in winter dry more regularly than those cut at other seasons, and also show a greater loss in moisture at the end of six months' seasoning. The advantages of winter cutting are, therefore, even drying, with a minimum liability to check, and light weight—an obvious advantage for shipment by freight. Spring or summer cutting secures a more rapid loss of moisture at first, owing to the temperature, but only for three or four months. At the end of from six to eight months spring and summer cut poles are found to have dried only three-quarters as much as winter-cut poles. Spring and summer cutting, however, would result in saving in freight and increased durability if the poles are to be shipped and used within three or four months after cutting.

The Tube-Mill.

The tube-mill consists primarily of a long revolving drum of steel provided with a driving gear for turning it, and with a lining of suitable material to form an inner abrasive surface, and to protect the outer cylinder from wear. The ends of the cylinder are closed by heavily re-inforced cast-iron heads, which have at their centers hollow trunnions through which the material is fed in at one end and discharged at the other.

The lining may be made of silex, a flint-stone quarried in Europe; ironite, a hard, close-grained stone found in this country; porcelain blocks, or chilled iron. At a recent meeting of engineers, W. R. Dowling, of the Robinson Deep mine, said that they had two tube-mills running—one with manganese steel and the other with silex lining. The latter took a larger feed and gave a finer ground product than the former; the pebbles also retained their rounded shape, while with the manganese steel lining flat faces were in evidence, showing a sliding action.

Flint pebbles form the grinders. These are introduced through a manhole at the start, and the supply is replenished from time to time as they become reduced by wear. Grinding is accomplished by keeping the cylinder filled to a little above its axis with ore and pebbles, the whole mass to revolve slowly. The mass tumbles over and over with a wave-like motion, thus utilizing an enormous expanse of grinding surface.

The fineness of the finished product is controlled by the feed to the mill and also, to some extent, by the relative amount of water introduced. Generally speaking, with other conditions unchanged, retarding the feed increases the fineness; and increasing it, reduces the fineness.

Fig. 1 shows clearly where the material to be pulverized is fed into the mill. A flanged connection leading into the trunnion is provided, making it possible to connect the feed-pipe so as to control the feed and at the same time prevent any untidy slopping about of wet tailing. The flow of the material into the mill is with the water, and by gravity, and is intended to be controlled by a valve in the feed-pipe. The trunnion opening at the discharge end, shown in Fig. 2, is left open so that the character of the finished product may be examined at any moment. The end of the trunnion is flanged out and fits into a funnel-shaped guide, which prevents any spilling of the product. Fig. 3 shows the inside of the discharge and with the screen provided to prevent the exit of any coarse particles of the grinding pebbles. The central discharge is one of the latest improvements.

The driving gear can be placed at either end of the mill, as may be desired. The main bearings are provided with large openings for grease-soaked waste. The counter-shaft has collar-oiling, self-oiling bearings. But little time need be lost in replacing worn bearing liners. For the main bearings it is only necessary to jack up the barrel, give a liner a half-turn to the top of the shaft and draw it out. A new liner may then be slipped into place. Liners for the counter-shaft bearings are replaced in a similar manner. The main gear is machine molded.

A mill of 60 in. diam., 22 ft. long, requires about 35 h.p., with 60 to 70% excess momentarily in starting. When Danish flint pebbles are used the consumption will amount to about 100 lb. pebbles per 100 tons of material pulverized. Iron linings last from 7 to 10 months. Silex linings 2½ in. thick last about 60 days.

The capacity will depend upon the conditions under which it is operated. The varying percentage of fine that will be in the product going to the tube-mill will have a distinct bearing on the tonnage that it will handle. For example, in speaking of a product passing a 30-mesh screen, before it is delivered to the tube, there may be 50% of that material which will pass 60-mesh, or there may be only 25% which will pass 60-mesh. This variation in size of the feed naturally will have a corresponding influence on the work which the tube has to do, to make a product of desired fineness. In a majority of cases, it is best to separate the fine from the feed by hydraulic classification before the ore reaches the tube-mill. In some cases it is desirable to classify the product again after it is discharged, returning the over-size to the mill for further reduction. Under such conditions, the mill will handle a larger tonnage; and as the discharge is classified, it insures the return of the over-size for re-grinding.

In one particular instance a 5 by 22-ft. mill, when taking a feed that has passed 30-mesh and reducing it so that about 97% would pass 200-mesh, has handled three tons per hour. In another instance a mill of same size, when taking a feed that has passed a 15-mesh screen, after which it is classified to remove the fine, has handled 12 tons per hour, of which 96% would pass 60-mesh, but in this case the discharge was classified, the coarse material returning to the mill. This variation indicates that the conditions govern the capacity for each particular case. —*Bulletin* No. 1410, Allis-Chalmers Company.

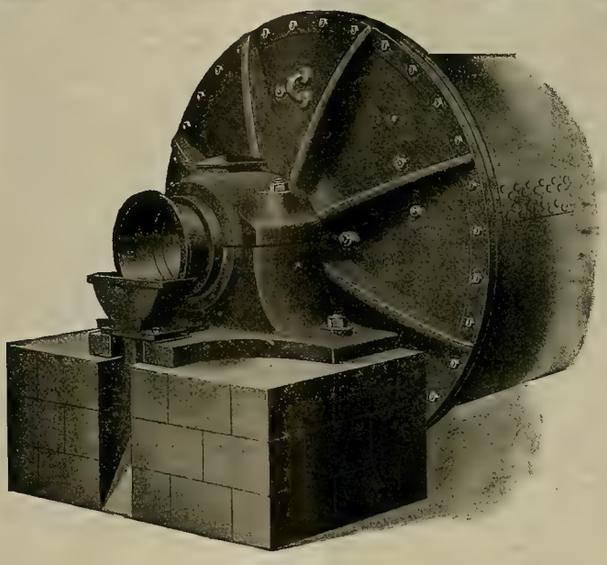


Fig. 2.

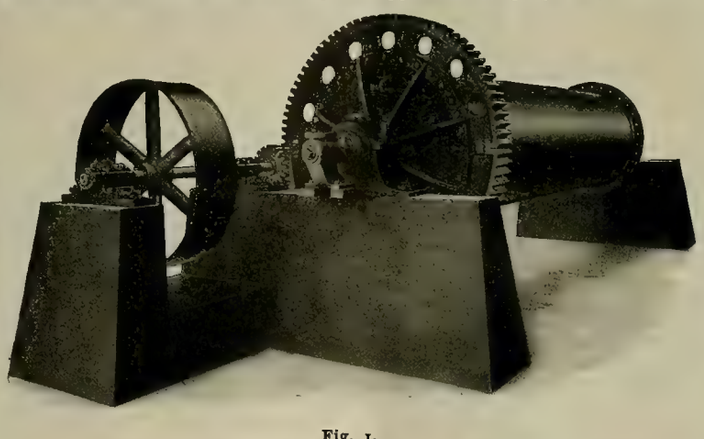


Fig. 1.

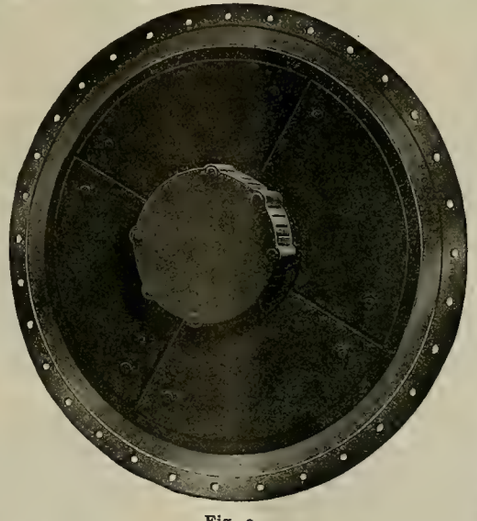


Fig. 3.

THE chief metallic product of Chile is copper, of which, in 1903, 36,600 tons were produced, valued at $7,150,000. The primitive methods employed in mining and reducing the ore greatly lessen its output. With modern machinery and appliances the preparation of the copper for market could be made more profitable. There was also produced 1½ tons of gold, valued at $600,000; silver 42 tons, valued at $425,000; lead, 77 tons, valued at $3,000; manganese, 18,500 tons, valued at $225,000; cobalt, 22 tons, valued at $33,000; iodine, 171 tons, valued at $540,000; borax, 18,350 tons, valued at $790,000; salt, 17,680 tons, valued at $108,000; sulphur, 3,740 tons, valued at $112,000; coal, 898,900 tons, valued at $2,750,000; and nitrate of soda, 1,570,000 tons, valued at $46,700,000. The nitrate product is the greatest source of government revenue.

The Prospector.

Enquiries sent to this department are answered free of charge, submitted by subscribers who are not in arrears The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The sample marked B. B., from Sonora, Cal., is aplite, a dike granite, with little or no mica.

The black ore from Fish Lake Valley, Nev., is principally magnetic iron. It is probable that this ore overlies a deposit of copper ore.

The rock from Havilah, Cal., marked G. E. T., is a much altered basic dike rock. It consists of decayed feldspathic material and talc scales.

The rocks from Table Rock, Cal., are: No. 7, diorite; No. 8 is a globular form of pyrite (iron sulphide); No. 9 is quartz incrusted with pyrite.

Of the two rocks sent by C. R. from Stockton, Cal., the reddish ore is hornblende granite, the other mica schist, probably due to alteration of a rock similar to No. 1.

The rocks from Tehachapi, Cal., are the following: No. 1, serpentine; No. 2, trachyte; No. 3, chert; No. 4, quartz, colored green, by chlorite; No. 5, rhyolite tuff; No. 6, andesite.

The rocks from Berlin, Wash., are granitoid and contain considerable magnetic iron. The ore is somewhat unusual. The gangue appears to be scales of a silvery white mica.

The rock from Ingot, Cal., is a variety of serpentine. It sometimes carries chrome iron ores, and is often associated with copper ores and gold at contact with other rocks, also with cinnabar.

The bright, shimmering scales on the yellowish-brown, silicious ore from the January mine at Goldfield, Nevada, is margarodite, a silvery hydro-mica, the result of alteration of feldspar, in all probability.

Of the two samples from Helena, Mont., marked C. B., the smaller and lighter piece is felsite, and the larger and darker piece feldspar porphyry. Possibly these two rocks may be found in different parts of the same mass. The sketch indicates that a fault has dislocated the flat vein.

The rocks from Parral, Mexico, marked G. L., are: No. 1, light green, probably a finely consolidated greenstone tuff; No. 2 also greenstone, amygdaloidal, the air vesicles being filled with infiltrated mineral (calcite). No. 3 is a dike rock, apparently a silicified andesite. No. 4 is syenite.

The rocks from Red Rock, Ariz., are: No. 1, a very silicious aplite (a micaless, granitoid rock); No. 2, also a silicious dike rock, containing pyrite; No. 3, basaltic rock; No. 4, aplite (same as No. 1). These rocks, No. 1 and 4, are the 'alaskite' of Spurr; No. 5, andesite; No. 6, granite; No. 7, limestone.

The rocks from Columbia, Nev., marked R E H M, are: R, amphibolite schist; it consists largely of feldspathic material and talc scales; it may have been originally diorite. E is diorite much altered; the hornblende is altering into chlorite and epidote; an occasional grain of quartz may be seen in the specimen. H is apparently andesite, but is much altered, the feldspar being much decayed. M is almost wholly quartz, and seems to be silicified rhyolite; this last rock may contain gold.

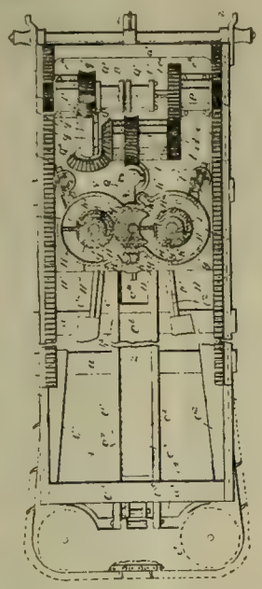
The rocks from Columbia, Nev., may be described as follows: The piece marked W is brown chert or jasper, a silicious rock stained by brown iron oxide. The glassy looking crystals are free quartz. This rock has resulted from the chemical alteration of some previously existing rock, possibly limestone, or even a silicious rock. The occurrence of the glassy quartz grains only illustrates a further stage of alteration of the rock. Free gold occurs in both the chert and the quartz. The samples marked L are limestone in which there are indistinct traces of fossils. There is no indication of the existence of petroleum in this rock, but ore deposits may occur at or near contact of intrusive rocks, if such exist in the region of the limestone. These ore deposits may contain lead, silver, copper, gold, iron and other minerals.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 6, 1906.

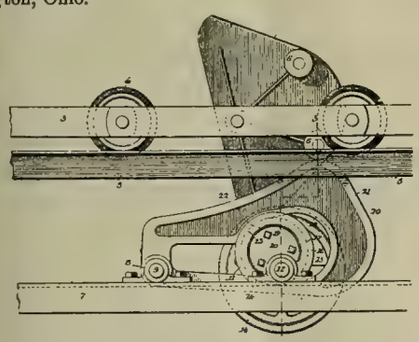
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINING MACHINE.—No. 813,508; E. R. Merrill, Columbus, Ohio.



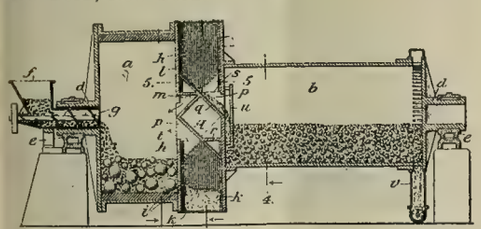
In mining machine, combination with bed, carriage adapted to move relatively thereto and cutter chain on carriage, of sprocket wheel engaging with and driving the chain, vertical shaft *l* to which sprocket is secured, worm on shaft for transmitting power to carriage-advancing mechanism, gear wheel on shaft, and two vertical engine shafts having their axes of rotation in plane transverse to carriage frame and in front of the driving sprocket wheel, casings of motors being arranged within the longitudinal planes of the sides of bed frame, rotary pistons connected with and rotating shafts and driving pinions on shafts engaging with and driving gear wheel *l* on sprocket shaft.

CONVEYER.—No. 813,474; F. R. Willson, Jr., Worthington, Ohio.



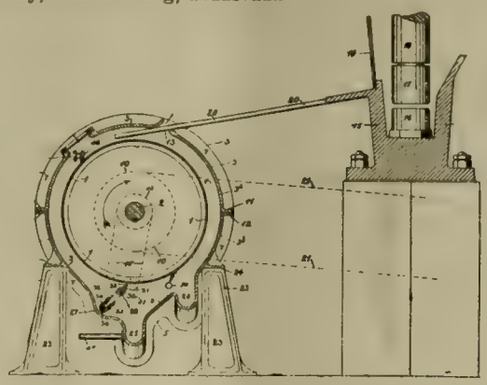
The combination with an elevator having swinging buckets, of tilting device for buckets in which is formed an open slot, eccentric mounted in slot and arranged to positively move tilting device both into and out of operative position, and means for operating the eccentric.

GRINDING-MILL.—No. 813,903; P. T. Lindhard, New York, New York.



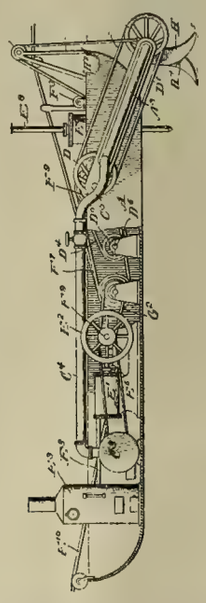
In a grinding-mill, the combination of grinding-drum, means to deliver thereto material to be ground, separator having compartment formed therein, means to deliver partly ground material to separator, and second grinding-drum, separator having means within compartment adapted to deliver finely ground material to second-named drum, and also having means within compartment adapted to return tailings to first-named drum.

AMALGAMATOR.—No. 813,780; D. Draper and G. A. Hay, Johannesburg, Transvaal.



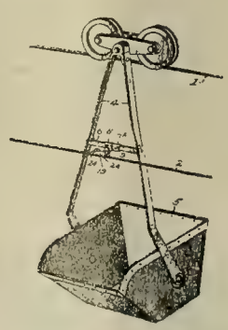
An amalgamating machine comprising drum, periphery of which is made the amalgamated surface, casing completely inclosing drum, casing being constructed with longitudinal inlet or slot above drum, and with recess or sump in bottom to receive concentrates removed from surface of drum, and with another sump or recess to receive amalgam when it is removed from surface of drum, revoluble brush arranged longitudinally of casing for cleaning amalgamated surface of drum, means for rotating brush, a scraper journaled longitudinally of drum and adapted to be brought into contact with amalgamated surface, means for traversing scraper longitudinally of drum in either direction, and water-spray pipe located beneath drum for washing concentrates off amalgamated surface of drum.

GOLD DREDGE.—No. 814,019; H. J. Clark, Boise, Idaho.



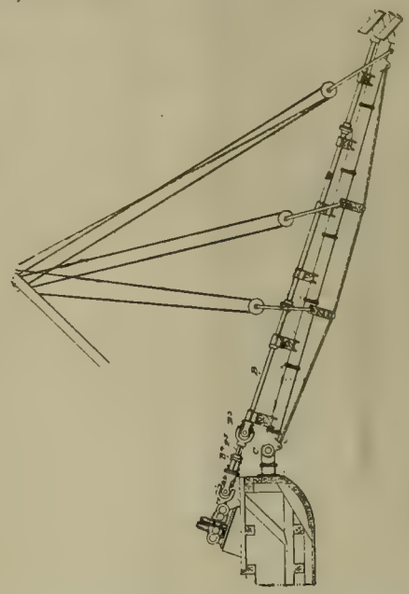
In a dredge, scoop provided with conducting space therein and reticulated face thereto, hollow hub communicating with space, means for creating suction within hub, means for oscillating scoop, swinging arms upon which hub is mounted, means for raising and lowering arms, and curved plates secured to outer faces of arms to form conducting passages upon arms communicating with hub.

TRAMWAY BUCKET AND ROPE CLIP.—No. 814,622; B. C. Riblet, Spokane, Washington.



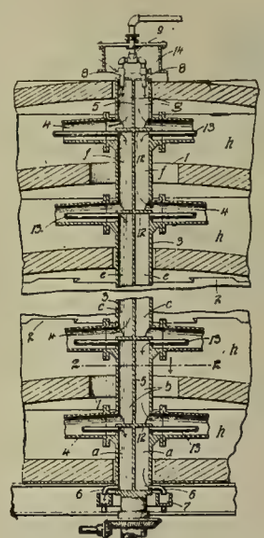
In rope and bucket clip, socket member secured to tramway bucket and body portion with ball at one end pivotally secured in said socket and attached at its opposite end to a traction rope.

DREDGER.—No. 814,204; N. R. Harris, San Francisco, California.



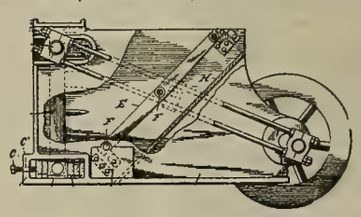
In dredger, cutter-shaft mounted upon a swinging ladder, driving means upon said dredger, universal and slip joints interposed between said cutter-shaft, and the driving means near the pivot of ladder.

ROASTING-FURNACE.—No. 814,298; F. Klepetko, New York.



In a rabble apparatus, a hollow rabble shaft having its passage-way divided into series of conduits, and means for independently supplying each conduit with suitable cooling medium.

ORE AND COAL CRUSHING MACHINE.—No. 814,085; J. F. Sauerman, Russellville, Arkansas.



In ore-crushing machine of the class described, suitable frame, reciprocating crusher-head mounted in frame, means for reciprocating crusher-head, and a back plate, back plate consisting of a plurality of separate bars, spacing rods on which bars are strung, means for adjusting the bars toward and from each other on rods, and supporting cross-beams independent of rods for sustaining the ends of the bars against the crushing strain.

PROCESS FOR THE RECOVERY OF PRECIOUS METALS FROM ORES, ETC.—No. 814,294; J. A. Just, Pulaski, New York.

The process of recovering precious metals from ores or materials containing metals which consists in subjecting ores or materials to action of nascent oxygen and an acid capable of forming compounds with oxides of precious metals formed and dissolving compounds.

Mining Summary.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Special Correspondence.

LONDON, March 7.

Mr. J. H. Curle's letter on gold dredging which appeared in your issue of January 27 has attracted considerable notice here. His authoritative opinion "that the Oroville gravels—proved as they are—form the safest gold-mining venture in the world," naturally makes stockholders in Oroville Dredging, Ltd., feel pleased with themselves. Some particulars of this company in which London is so largely interested may be of use to your readers.

The company was formed in August, 1905, and registered in the State of Maine, U. S. A., with a capital of $3,500,000 in shares of $5 each, to work four concerns, namely: The Boston & California Dredging Co., The Boston & Oroville Mining Co., The Bear River Mining Co., and The Oroville Gold Dredging & Exploration Co. The first three are taken over, but although the Oroville Gold Dredging & Exploration Co. has also come into the deal, the formality of handing over the property is not reported as concluded. The present issued capital of the Oroville Dredging, Ltd., is 570,000 shares; the balance of 130,000 shares will be issued against transfer of the remaining property referred to. It is stated that there are four new dredges, of latest design and large capacity, under order. Until these are delivered no work is being done on the Bear River property, but there are three dredges in operation on the Boston and California ground, one of which is a large modern machine, and three on the Boston and Oroville. The working of these six dredges for the three months ending October 31, 1905, treated 990,682 cu. yd., which yielded gold worth $153,046, or an average of 15.44 cents per cu. yd. The operating cost during this period averaged 3.44 cents; and the renewals and repairs 3.22 cents, including abnormal charges owing to important replacements in one of the dredges. Royalties amounting to $4,555 in respect of Boston and California dredges No. 1 and 2 were paid, and after taking into the account Boston office expenses and the income of about $6,000 from the company's machine shops, etc., a net profit of $87,000 accrued. The first quarterly dividend of 12½ cents per share, or 10% per annum, was paid out of these profits on December 15. The returns which have been published since the end of October have fully maintained the previous average, and a second dividend at the same rate for the quarter ending January 31 has now been announced.

On the Oroville Gold Dredging & Exploration Co.'s property there are two dredges in operation, with an aggregate capacity of about 120,000 cu. yd. per month, one of them being of the largest type, and when this property is handed over, it is expected there will be a further increase in the returns.

Mr. W. P. Hammon in his report, May, 1905, estimated the contents of the four properties at 114,617,814 cu. yd., representing a net value, after deducting the cost of working, at 5c. per cu. yd., of £2,027,059. It is anticipated the company will continue to pay minimum dividends of 10% until the four additional dredges have been installed, and that thereafter the earnings will be upward of 20%, but it is intended to pay up to 15% during the remainder of the company's life—estimated at about 15 years—and from the surplus profits to set aside a sinking fund to provide the return of the capital when the properties are worked out.

The Exploration Co., Ltd., since its reconstruction in 1904, after coming to grief over financial schemes which had nothing to do with mining, has, under the management of Mr. R. T. Bayliss, achieved a decided measure of success. Of its total capital of £750,000, the company's investments taken at cost, which by a coincidence happens to be within a few hundreds of pounds of the marketable values, account for a total of £693,114. It is of interest to notice the principal of these investments. They comprise: £178,756 in South African gold mining shares; £107,378 in town property and buildings at Johannesburg; £110,737 in El Oro, Mexican Mines at El Oro, and Somera Gold Mining Co.; £62,535 in Tomboy and other gold mines in the United States, and £43,313 in American copper mines. The net profit of the company for the year 1905 was £67,813. This added to the previous balance of £30,261 made a total to credit of £98,074, from which a first dividend of one shilling per share—absorbing £37,500—was declared at the annual general meeting held last week. During the past year the company has extended its sphere of operations to the development of a copper mine in Peru, and the directors have formed a South American Exploration Company to deal with interests in that part of the world, especially in Peru and Bolivia. In the course of his speech at the meeting, Mr. Bayliss mentioned incidentally that in spite of the present depressed state of Kaffir shares, he was of opinion they were worth buying now and he anticipated a profit from those the company had purchased.

The annual report of Jumpers Deep Co. to September 30, 1905, is of a retrograde character. From 240,209 tons of ore sent to surface 23.03% was discarded in sorting; 184,358 tons were milled from which gold to the value of £265,432 was recovered, or an average yield of 28s. 9½d. per ton, being 3s. per ton less than for the previous year, the stoping from ore reserves having proved of lower grade than had been anticipated from the sampling; there was also a falling off in development values and width. Working costs increased by 3s. 6½d. per ton. Net profit, £25,135. The developments amounted to 6,850 ft., of which 72% in reef formation. Ore reserves estimated at 428,342 tons.

The New Rand Syndicate, Ltd., is beginning to excite enquiry, but little information, except of a general character, has so far been vouchsafed. It is said that developments taken in hand over a year ago are proceeding with unusual vigor. The formation is described as a ridge some 1,000 ft. above the surrounding country, and the deposit is supposed to extend for 14 miles. The ridge has been pierced by a number of tunnels at 100, 600, 800, 900 and 1,000 ft. below the top of the outcrop, and it is said that astonishing results have been obtained, the lowest value being about one ounce per ton.

The report of the London & West Australian Exploration Co., Ltd., for 16 months to December 31 shows a net profit for the period of £21,265. This has been written off the debit balance, which arose out of the disastrous crisis in 1901-2, thereby reduced to £5,953. The directors state that during the year 1904-5 no important discoveries were made in West Australia, and no revival of public interest took place in the mining industry to offer special opportunities for the company's operations.

According to the portion of British mining statistics for 1905, which has appeared, the total output of coal was 236,111,150 tons—an increase of 3,699,366 tons over 1904; ironstone 7,860,969 tons—an increase of 303,236 tons.

Is Cornwall going to benefit by the restriction of the mining industry in South Africa? The archives of Somerset House reveal the fact that Tywarnhaile Syndicate, Ltd., was registered some eight months ago with a nominal capital of £22,500, of which £7,500 was called up. Amongst the leading shareholders are found the Consolidated Goldfields of South Africa for 5,293 shares and the South African Gold Trust for 4,000. The property is within a mile of the Atlantic and is situated in a district which flourished some 50 years ago, extending from almost the sea-shore on the north to Scorrier, some four or five miles to the south.

At the Basset Mines, Ltd., annual meeting last week a profit was reported of £6,408 from the gross income of £58,946. The milling for the year amounted to 49,587 tons, yielding an average of 34.7 lb. black tin per ton, an increase, respectively, of 5,719 tons and 3.4 lb. over 1904.

Good progress is shown by Dolcoath for the half year to December 31. Although the quantity of tin ore crushed—48,472 tons—was slightly less than for the previous half year, the grade was better—40.06 lb. per ton against 37.20 lb.; 866 tons of black tin were sold and the profit realized was £22,385, against £12,340 for the half year to June 30. The proceedings at the annual meeting last week were of unusual interest. The manager, Capt. A. Thomas, reported that the mine was in a better condition underground with a finer surface equipment and stronger financial position than for many years past. Favorable developments were proceeding in the upper levels, but the point of paramount importance was the recent improvement in the bottom of the mine. In the winze 22 fathoms below the 470-fm. level the lode had been cut through for a width of 12 ft., producing 1½ cwt. tin per ton of stuff; the lode would be found still wider as the stope above gave a width of 4½ to 5 fathoms. Capt. Thomas stated his intention to continue his method of expressing the lode-values in pounds of tin per ton instead of in the old system of pounds sterling per fathom, which he said veiled the facts in undesirable obscurity. Intelligible information should be given to the public outside the County, who are now giving more attention to Cornish mining than formerly. With regard to the ore reserves, Capt. Thomas stated that owing to the nature of the formation, frequent instances of large areas of impregnation of tin oxide without any distinct hanging or foot-wall—any estimation of ore reserves in Dolcoath must be somewhat problematical, but making reasonable reservations, he put the workable reserves of tin-bearing ground at 270,000 tons. As an evidence of the increased interest taken by the public in the mine since the adoption of limited liability, it was stated that the shareholders now number 1,673, as against 400 under the cost-book system.

CALUMET, MICH., March 17.

Mining operations in No. 5 shaft of the Tamarack mine were resumed this week after an idleness of three months, caused by the fire which started in No. 2 shaft. The drifts connecting No. 5 with No. 2 at the twenty-ninth and thirty-first levels were bulkheaded to prevent the poisonous gases lingering in the latter from gaining entrance to the workings filled with men in No. 5. The gas still lurks in remote and inaccessible workings of No. 1 and 2 shafts and it is problematical when conditions will permit the resumption of operations underground from these shafts.

The situation at the Tamarack is annoying. While the fire caused a material loss in the mine of probably only a few hundred dollars, being extinguished promptly, the gas given off by the burning timbers has prevented the usual operations, and caused a decrease in copper production of not less than 3500,000.

With No. 5 shaft in commission the Tamarack will be enabled to increase its output and operations will be pushed with all possible speed until they can resume in No. 1 and 2 shafts. No. 3 shaft, at the North Tamarack branch, is the only opening that has been in commission during and since the fire. This is the deepest shaft in the world and has been shipping 1,100 to 1,200 tons of rock daily.

Sinking in the Allouez's No. 1 shaft is approaching the seventh level which it is expected will be reached early next month. Drifts were recently started from the shaft at the sixth level and excellent ore was revealed. Particular interest is felt in the work at the sixth level, as this is the first level at which the company will be able to open the Kearsarge amygdaloid bed to the full extent of its property. Early in the spring it is likely the Allouez management will resume work in its No. 2 shaft, which has been at a depth of fifty feet for several months. This shaft should intercept the Kearsarge lode and become a producer in two years.

Reports to the effect that there was to be a revival of activity at the Phœnix Consolidated property in Keweenaw county was apparently ill-timed. Likewise there appears to be no truth in the report that the Calumet & Hecla Co. was negotiating for the mine. The Phœnix in 1905 produced 273,219 lb. of refined copper, as compared with 1,162,201 lb. in 1904. It will not have any standing among the producing mines this year, as no work has been done since last summer.

Preparations for spring activity on the lands of the Keweenaw Copper Co. in Keweenaw county, are being made. The exceptionally light winter will permit an early start in the test-pitting, cross-trenching and other surface exploratory work which cannot be done to advantage during winter. An office building is being erected on the company's Mandan property. The first drill is now working on the south end of the Mandan tract and has reached a depth of 75 ft. in search of the Kearsarge lode. The other diamond drill is on the Resolute where the hole has been put down vertically for 350 ft. in search of the Montreal River lode. The Montreal River bed has already been found at other points and the approximate strike-line of the formation across the property determined, and it will be further tested during the summer. Captain Thomas Hoatson of Calumet is mining director of the Keweenaw Co. He was formerly in charge of mining work for the Calumet & Hecla Mining Co., but resigned a few years ago, his extensive interest in Arizona and elsewhere demanding greater attention. He is a director and vice-president of the Calumet & Arizona mining Co., and the four Bonanza Circle mines at Bisbee, Arizona.

Captain James Hoatson, president of the North Butte Mining Co., is another member of the directorate of the Keweenaw Co. With Thomas F. Cole and the two Hoatsons in the company, the Keweenaw will not lack for able mining direction.

Sinking in the shaft at the Superior mine, in which the Calumet & Hecla Mining Co. recently secured a heavy interest, has reached the third level. Some time will now be consumed in crosscutting to the Baltic lode. No other work is under way at the property.

BUTTE, March 19.

The February copper production of the Butte district amounted to 26,129,600 lb., the apparently small total being due to the short month; that the mines of the Trenton Co., one of the amalgamated properties, have been closed, and that the Clark mines yielded a decreased quantity of ore, owing to the fact that the Clark concentrator has been destroyed by fire, and some of the ore, a lesser quantity than formerly mined, is now being shipped to the Washoe smelter. The February daily and monthly average of ore mined in Butte and the average yield of copper per ton of ore were as follows:

Companies.	Daily tons of ore.	Monthly.	Lb. copper per ton.
Boston & Montana	3,600	100,800	70
Anaconda	3,550	99,400	66
Butte & Boston	525	14,700	62
Washoe	450	12,600	65
Parrot	500	14,000	68
North Butte	1,000	28,000	120
United Copper	1,500	42,000	65
Clark's Original	1,000	28,000	70
Pittsburg	200	5,600	78
East Butte (lessees)	125	3,500	160
Miscellaneous	400	11,200	70
Total	12,850	359,800	

The total daily and monthly yield of copper was as follows:

Companies.	Daily Lb.	Total Lb.
Boston & Montana	252,000	7,056,000
Anaconda	234,300	6,560,400
Butte & Boston	32,550	911,400
Washoe	29,250	819,000
Parrot	34,000	952,000
North Butte	120,000	3,360,000
United Copper	97,500	2,730,000
Clark's Original	70,000	1,960,000
Pittsburg	15,600	436,800
East Butte (lessees)	20,000	560,000
Miscellaneous	28,000	784,000
Total	933,200	26,129,600

The sale of a controlling interest in the Butte & London Mining Co. to the Venture Corporation of London is locally regarded as a good thing for the Butte district, as it brings into the field another big operating and promoting company. The deal was made by individual holders of the majority of the stock, after an engineer of the Venture Corporation had spent a week in Butte making an examination of the Butte & London property and surrounding mines. The Butte & London ground, consisting of 113 acres, lies between the North Butte mines and the mines of the Butte Copper Exploration Co. For the present there will be no change in the local management of the Butte & London, as the new owners are satisfied with the work and progress being made. The three-compartment shaft has reached a depth of 140 ft. and will be sunk to 1,500 ft. before crosscutting is done. The Venture people have for some time been trying to get a foothold in Butte district and the Butte & London proposition offered the opportunity.

A number of Amalgamated mines in Butte shut down two days last week owing to extreme cold, which froze up the water flumes at the Washoe smelter at Anaconda. On account of ice running in the flumes the concentrator could not be operated and the ore-bins and cars were soon filled with ore. The weather moderated and the concentrator resumed operation after a brief shut-down. The Boston & Montana smelter at Great Falls was not interrupted, although the water supply there was also frozen, but that company has a modern steam plant, as well as a water-power plant, and when the water-power froze up the steam-power was turned on and was used during the continuance of the cold spell.

The new hoisting engine for the North Butte Co. has finally reached Butte and is being placed in position.

Another copper mining company has been incorporated, called the Butte Copper Co. Its promoters are Mayor John MacGinniss, W. V. Lawler and E. H. Sherman, all of Butte. The new company owns two-thirds interest in the Robert Emmet No. 1 and Robert Emmet No. 2 mines; all of the Anselmo No. 1 and the Anselmo No. 2 and all of the Trifle. The ground lies for 2,300 ft. on the extension of the Gagnon and Stewart veins, just west of the Gagnon mine of the Trenton Co. The Butte Coalition Co. owns a third of the Emmet mines, as successor to F. A. Heinze. There is a shaft 300 ft. on the Emmet, and the Anselmo mines also have some development. The latter produced about $500,000 in silver some years ago. The Emmets were worked until recently under lease and option, but the parties holding the option were hampered by a lack of funds and inability to handle the water. When they quit it was reported they had cut into a body of 7% copper ore. There

seems to be little doubt these mines are on the Gagnon lead. The Silver King and Plymouth mines, silver properties, which have for years been tied up in litigation, adjoin the Anselmo and are on a branch of the Anselmo vein.

Heinze's Butte followers have a new report about his future intentions regarding United Copper, to the effect that he will transfer the Lexington group, at present an independent concern, known as La France Copper Co., and that he will take up an option on the Blue Bird silver mines west of Butte. The Blue Bird once produced silver, and was owned by the Van Zandt people of New York, but, because the mines proved disappointing, Ferdinand Van Zandt committed suicide. This was about 15 years ago. Since then nothing has been done on the property except to dismantle it and tear down one of the finest surface plants in the State.

The reports among the Anaconda miners are persistent that the big vein which some months ago was cut on the 2,200-ft. level of the mine has also been cut on the 2,400-ft. level, and that the ore there is not nearly so rich as it was on the 2,200, though the orebody is fully as extensive. The officials, however, deny that the vein has been cut again, declining to discuss the matter or to give out any information at all regarding it.

The Butte Copper Exploration Co. has the water out of the shaft of the Six O'Clock mine and will shortly resume active development.

The Raven Mining Co. is opening the north vein on the 1,500-ft. level. The south vein on the 1,200-ft. level is being developed, and the ore found in the crosscut maintains its richness and is growing wider in the drifts.

The east Butte Co.'s leasers are hoisting 125 tons of ore daily that runs from 8 to 12% copper, on which the company is paid a royalty of 25 per cent.

TORONTO, March 14.

The experiments in the electric smelting of iron ore, which have been carried on at Sault Ste. Marie for about two months, were completed on the 5th inst. They are reported entirely successful in demonstrating that iron ore can be economically treated by the electric smelting process. Dr. Eugene Haanel, Canadian Superintendent of Mines, who supervised the experiments, is preparing a detailed report which will shortly be published giving full particulars. In an address before the Canadian Club of Toronto on the 12th inst. Dr. Haanel gave an interesting account of the tests, showing what had been accomplished in demonstrating the commercial practicability of the electric process.

He prefaced his remarks by a review of the existing situation in Canada as regards the rapidly increasing demand for steel and the resources which Canada possessed to meet these requirements. Large deposits of iron ore existed in the central districts, but the coal essential for coke was only found in the extreme East and West so that the country was at a disadvantage in the manufacture of iron and steel by the ordinary methods. This rendered it evident that the question of electric smelting was one of supreme importance to the industry. After recounting the results of enquiries made by the commission appointed to investigate the subject in Europe, where they witnessed experiments at La Praz and Livet, in France, Dr. Haanel pointed out that before the feasibility of electric smelting in Canada could be determined the following points, which could not be settled by European experiments, required to be determined.

Can magnetite be successfully smelted?

Can iron ore with considerable sulphur content, be made into pig iron of marketable value?

Can charcoal be substituted for coke, which must be imported?

What is the exact amount of electric energy required per ton of pig iron produced?

The experiments at Sault Ste. Marie were accordingly arranged with a view to determine these points. The work of preparing for and directing them was entrusted to Dr. Heroult of La Praz, France, and the co-operation of the Lake Superior Power Company, was secured. Dr. Heroult designed a furnace of 250 h.p. capacity, and a transformer to convert the electric current from 2,200 volts to 40, as required by the experiments, was procured from the Westinghouse Co. Electrodes, 5 ft. long, and 16 in. square were ordered from Germany. The furnace was of simple construction, the upper half being lined with fire brick and the lower half with carbon. An electric cable was attached to the carbon lining and to the transformers, to bring the current in contact with the ore. Peat charcoal was used and no difficulty was experienced, the furnaces working quietly and regularly.

The experiments on Canadian ores were fairly begun about the middle of February and lasted day and night until March 5. In all 150 casts were made yielding 55 tons of pig iron. For the first experiment the ore tried was hematite such as is used by the Algoma Steel Co. The remaining experiments were conducted with different kinds of Canadian magnetite, all of which, with one exception, were high in sulphur. It was found that the magnetite could be smelted with as much facility as hematite. Analysis of the iron produced, proved that although the slag was not particularly basic, the sulphur could be caused to pass into the slag, resulting in a pig iron containing a few thousandths of one per cent sulphur. Many magnetites are too high in sulphur to be handled by the blast furnaces, and thus have, so far, no commercial value. But it has been proved by these demonstrations that the best of pig iron can be made from ores containing as high as one per cent of sulphur. A blast furnace will not, as a rule, use an ore containing one-tenth of one per cent sulphur, and it therefore requires an ore which cannot be got at a low figure. While the Algoma Steel Works pay $4.50 per ton for the hematite ores they use, a pig iron of equal value and lower in sulphur content can be made by the electric process from sulphurous ores which are now obtainable for $1.25 per ton. The cost per ton of pig iron produced for electrodes, which in the French experiments amounted to 77c., had been reduced to 30c. Dr. Haanel estimated that the cost of developing electric energy from water power adjoining the iron ore deposits would be from $4.50 to $6 per horsepower yearly. He anticipated that a means would be found of utilizing the carbon monoxide, which now escapes, with the result of increasing the output by one-third or even one-half and if this took place, blast furnaces could not compete with electric furnaces even if coke were cheaper than at present.

Experiments with roasted and briquetted nickeliferous pyrrhotite containing 1.6% of sulphur were equally successful, furnishing a ferro-nickel pig containing 4½% of nickel and virtually free from sulphur. The experiment proved so satisfactory that the Lake Superior Co. are desirous of acquiring the plant for the purpose of converting their stock of briquetted ore into ferro-nickel pig.

In conclusion, the speaker emphasized the special importance of the utilization of ores with high sulphur content in view of the serious question which has arisen as to how long the present supply of blast furnace ores is likely to last. When these ores were exhausted and none but sulphur ores and titaniferous ores were available blast furnaces would necessarily be supplanted by the electric furnace as that alone could successfully treat such material.

DENVER, March 18.

The stormy weather accompanied by heavy falls of snow, which set in on March 1, and which has since prevailed throughout the State with unusual severity, has caused prodigious snowslides that have demolished and swept away mills and mine buildings valued at hundreds of thousands of dollars, and destroyed many lives. The storm, continuing at the present writing, bodes unprecedented disaster. It is too early to record the reported losses, for the unverified rumors of havoc seem almost incredible.

Construction of the Argentine Central railway was discontinued on the 14th inst., on account of the storm. It is the intention of the projectors to resume work on April 15. From the starting-place at Silver Plume, Clear Creek county, to the top of Mt. McClellan, its ultimate terminus, by a tortuous route, is a distance of 16 miles. The grading is nearly finished and the road is now in operation for a distance of nine miles from Silver Plume, which brings it within the productive area of the Argentine district. When completed the road will reach an altitude of about 14,000 ft. above sea level, and trains will be run over the ordinary two smooth rails on an average grade of four per cent. The road penetrates a promising mining section that years ago produced considerable ore, but which, since the decline in the price of silver and until quite recently, has been much neglected. Now, however, fresh development work is being prosecuted. The Waldorf Mining Co. is opening up and producing ore from a number of its properties, notably the Santiago and Manhattan mines. The Vidler tunnel, now in 800 ft., is projected to develop the Pennsylvania and Montezuma mines, the latter, one and one-half miles distant on the tunnel line, from its portal. The last four miles of the railroad is intended exclusively for tourists. The grandeur of the scenery along the route and from the top of Mt. McClellan is unsurpassed elsewhere in the Rocky mountains. W. H. Stillwell, formerly division superintendent of the Rock Island road and recently with the Uintah railway, is to become general manager of the Argentine Central railway.

The United Light & Power Company of Clear Creek county will hereafter be known as the United Hydro-Electric Company. The company has recently bought Heine boilers of 500 h.p. capacity, and new electric generators and accessories to double its present capacity. When the new machinery is erected, a 2,000 h.p. can be developed at the Georgetown plant; water and steam are utilized for prime powers. The Telluride Power Co., the pioneer electro-power company of the State, and the first to introduce high voltage currents for long-distance transmission in the mountains, is making improvements which, when carried into effect, will probably make it the largest producer of electric power in the State. The company has three generating stations in operation—two in San Miguel county, that is, one at Ames, another at Ilium, and a third at Ouray, in Ouray county. The fourth station site is selected, but its location has not been made public, and the fifth is under consideration. The accessions now under construction will bring the total capacity up to nearly 12,000 h.p. The Ames station, now producing less than 2,000 h.p., will have a complete new plant of 6,000 h.p. capacity. Water is the only initial power used by this company. Major Cooper Anderson, of Telluride, the executive officer of the company, has charge of the new construction.

Anent, the bringing of Vincent St. John to Telluride to stand trial for murder; the hysterical utterances of some of the Colorado papers would give color to the belief that they were paid to assassinate the State of Colorado. It is a reflection upon the mental standard of Colorado citizens that certain papers, continually given to misrepresentation and inciting bitter animosities, should receive support and be able to sell their wretched sheets. Crime is hateful, but the calculating mixers of the devil's broth that incites to crime are a thousand times more loathsome than even hired assassins. The real origin of the so-called labor trouble has never been published. We are not advocating the principles of the Western Federation of Miners; nevertheless, it would be a good trade if Colorado could 'swap' off her crop of over-ripe politicians for the Western Federation of Miners; the loss might prove a gain.

SALT LAKE CITY, March 20.

The construction of the Utah Copper Co.'s new Garfield concentrator is progressing satisfactorily. The first of the steel buildings to go up will be completed by the end of the present week. The contractors, the Minneapolis Steel & Machinery Co., have commenced the erection of the power plant, and the steel structural material for the main concentrator building is arriving on the ground. Bad weather has retarded the work. George O. Bradley, of Salt Lake, is chief engineer.

Notwithstanding stormy weather and bad roads, shipments from Park City last week were up to normal, the total output being 5,050,000 lb., the Silver King heading the list with 2,000,000 lb.; the Daly-Judge next with 970,000 lb. of ore and concentrate and 654,000 lb. of zinc middling; the Daly-West sent out 1,150,000 lb. of ore and concentrate, and the Kearns-Keith Co. and lessees made up the balance. The Little Bell Co. will probably make its initial shipment this week, and can be counted on regularly thereafter.

When Daniel Guggenheim, president of the American Smelting & Refining Co. visited Salt Lake recently, he made the statement that the American Smelters Securities Co. had purchased enough stock in the Balaklala Consolidated Copper Co. to give it a control; that the output of that California mine would be shipped to the new smelter, to be built near San Francisco, for treatment. This gave the impression that the original plans of the Balaklala company, which involved the building of a smelter at the mine, would be abandoned. This is not the case, however. Chief Engineer Robeson T. White, who has returned to the Salt Lake offices of the company from New York, has informed the writer that he has instructions to proceed to draw plans for a copper matting plant, having a capacity to treat 750 tons of ore from the Balaklala mine daily; that additional facilities will be provided for the treatment of custom ores. The matte product is to go to the San Bruno plant of the A. S. & R. It was the original intention of the Balaklala Co., before the Guggenheims became a factor in its management, to build a plant of 500 tons capacity and to produce blister copper.

There is a movement on foot for a consolidation of a number of mines in the Thayne's cañon section of Park City. It is proposed to join the Odin, California, Comstock and Silver Bell properties, and prospects of a consummation of the deal are said to be fair.

Although the recent conference between Daniel Guggenheim and Samuel Newhouse relative to a union of the Utah Copper and Boston Consolidated mines at Bingham failed in its object, there is a possibility that negotiations will be opened again later.

Important developments have been made in the Butler Liberal mine at Bingham during the past week. The main tunnel has encountered a large body of high-grade lead ore. An average sample taken across two feet of the ledge assays eight ounces in silver and 60% lead.

S. H. Roundy, manager of the Bull Valley Mining Co., operating an onyx property in Washington county, Utah, has reported the discovery of a two-inch streak of mineral in a white quartz vein. A sample was forwarded to Washington, D. C., where it was pronounced to be gibsite. Other deposits of the mineral in the United States are in Massachusetts and New York. Gibsite is an aluminum hydrate. Mr. Roundy resides at Benson, Cache county, Utah.

The engineers who have been conducting examinations of the properties of the Bingham Consolidated have completed their labors.

The management of the Yampa mine, at Bingham, has decided to equip that property with a two-mile aerial tramway, connecting the mine with the smelter in lower Bingham. At present, the company depends on the Copper Belt Railroad for transportation facilities, which have not always been satisfactory.

The St. Joe Mining Co., which is driving a tunnel on its Bingham properties, is in 2,725 ft. Considerable mill ore has been encountered. R. A. Hasbrouck of Salt Lake is manager.

In the hearing of the smelter-smoke cases that have been pending for some time before Master in Chancery S. H. Lewis, the defendant smelting companies involved began submitting their evidence during the close of last week. Numerous mine managers were placed on the stand to show that tens of thousands of people in Utah and surrounding States are dependent on the smelters operated in the Salt Lake valley, and that if the smelters were ordered closed, the mines would thereby be forced out of business.

At the annual meeting of the shareholders of the West Quincy Mining Co., with properties at Park City, G. D. B. Turner, James H. Moyle, W. H. Dodge and N. Treweek, of Salt Lake; Dr. E. A. Van Norman, of Los Angeles; J. R. Rand, of New York, and Sherman Fargo, of Park City, were chosen directors. Mr. Turner was re-elected president and general manager.

The Starless copper property at Bingham, owned by E. A. Wall of Salt Lake, is to be the scene of vigorous exploration and production. A compressor plant is to be installed. Ore will be sent to the mill within sixty days.

Excavating for the new works of the Utah Smelting Co. near Ogden is about to be started. A railroad spur to connect with the tracks of the Oregon Short Line, Southern Pacific and Ogden & Northwestern is being built. The initial unit will consist of a copper matting furnace of 150 tons daily capacity, and will be furnished by the Colorado Iron Works Co. through Clement & Strange, Salt Lake agents; the Allis-Chalmers Co. have the contract for the sampling mill. David Eccles, of Ogden, is president of the smelting company.

The West Tintic Mining Co. has filed articles of incorporation to operate in the West Tintic mining district. J. H. Burrows is president, W. F. Shriver vice-president, J. E. Driscoll, of Eureka, Utah, secretary and treasurer.

Last week's ore shipments from the Tintic mining district amounted to 156 carloads, the shippers and amount being:

Gemini	21	Scranton	1
Centennial Eureka	54	Bullion-Beck	5
May Day	2	Ajax	2
Eureka Hill	9	Black Jack	1
Beck Tunnel	8	Carisa	2
Eagle & Blue Bell	7	Lower Mammoth	3
Uncle Sam	3	Mammoth	13
Swansea	2	Grand Central	15
Yankee	2	Victoria	3
Dragon Iron	3		

The ore and bullion settlements at the close of business last week were reported at $415,500.

The unusual activity of southern Nevada is being carried into southern Utah, and many old camps are again attracting attention, and new discoveries are being reported from numerous districts. The construction of new railroads through the southern portion of the State is aiding materially in this renewal of mining activity.

ARIZONA.

Cochise County.

A strike was made recently on the Elizabeth claim, close to the Elizabeth, Alta Vista and Keystone, near a contact of quartzite and lime, in a tunnel at a depth of 20 ft. The ore from this strike is reported to assay 2,800 oz. silver, 30.7% lead and rich in gold. The vein is three feet in width. The tunnel is in 45 feet.

Water has been encountered at the Hoatson at Bisbee and sinking has been discontinued for the past week while a station is being cut on the 1,050 level. Water was encountered in the Hoatson shaft at a depth of 1,120 feet. At the station on the 1,050 a large tank is to be installed. Sinking pumps will raise from the bottom to this tank and from this level the water will be handled with bailers to the surface.

Sinking will be resumed at the Hoatson, and the shaft put down to the 1,150 level, when drifting will be started. When sinking was discontinued, water was coming into the shaft at the rate of fifty gallons per minute. When the Hoatson shaft reaches the 1,150, which corresponds to the 1,000 on the Junction, a drift will be run to connect with the Junction, a distance of 2,000 feet, work on the Junction end having already been started. In one month Jack Hinckley sunk the shaft 162 fect and the men at the Hoatson received a bonus for every foot in excess of 100. A big broom mounted on top of the shaft-house tells the story.

Yavapai County.

(Special Correspondence).—A meeting of the Yavapai Commercial Club March 14 was in the nature of a business men's meeting. The subject under discussion was a 'New era in Yavapai county.' This subject covers the condition of affairs in northern Arizona, as to mining, for never in her history has there been so much legitimate mining going on as at present. This is not confined to any particular district, for every district in the county is active.

The Bradshaw mountains are the scene of the greatest activity as far as large enterprises are concerned. The building of the Arizona and California railroad—a cut-off of the Santa Fe system from six miles north of Wickenburg on the Santa Fe, Prescott and Phœnix railway, to the main line near Parker, California—a distance of 105 miles, is facilitating the development of this richly mineralized section. The line is now in operation for 50 miles, to Salome, and with the recent completion of the several miles of tunnel through the Granite mountain the work of extending to the Colorado river will progress rapidly. The first 55 miles of the road is through McMullin valley, 15 miles wide, the road being equi-distant from the Harcuvar range to the north, and the Harqua Hala to the south. On penetrating the Granite mountains at the head of the valley, the route is on an easy grade to the river.

Both to the north and south of the line from 5 to 53 miles, there are sections in which profitable gold mining has been heretofore, and is now being carried on, and which will now come into greater prominence, owing to their easier accessibility. Among the older camps are Harrisburg, where are the Harqua Hala mines, and the Socorro mine, which the past few years has been profitably operated. In other portions of the Harqua Hala range there are other properties from which high-grade gold ores have been mined, while scores of properties, the ores of which could not be profitably handled on account of lack of cheap transportation facilities, will be developed. To the west of the Harqua Hala camp, and within 25 miles of the railroad is Quartzsite district. Still further west and near the Colorado river is the King of Arizona mine at Kofa, which has been productive of gold for years past. At Quartzsite the placering of gold gravels and the stamping of the free-milling gold quartz ores have been carried on, but comparatively little attention has been given to the workable deposits of lead-silver, copper-gold and cinnabar known to exist, nor to the lower grade gold ores of both free milling and refractory character.

The depth attained in any of the older mines has been inconsiderable, the deepest being the Harqua Hala. While the important ore deposits in the Harqua Hala, Granite and Quartzite ranges are gold, copper predominates in the Guadalupe range to the south of the line, and in the Harcuvar and other mountains to the north. The importance of the copper deposits of the country about Bill William's fork, the dividing line between Yuma and Mohave counties, has long been realized, and some high-grade copper-ore shipments are recorded. With the approach of the railroad there is a noticeable increase of operations in that section.

Several miles to the south of the Bill William's fork an important gold strike is reported on the Carrigan-Rogers properties on Black mountain, twenty-five miles east of the Colorado river. For a distance of more than a mile with a width of from thirty to fifty ft., free gold quartz ores have been broken at the surface and in shallow prospect holes. Systematic development is now under way by the Clara Gold & Copper Mining Co., owning the Carrigan-Rogers group, as well as by other companies and individuals. A postoffice known as Clara has been established in the camp, which is now reached by fairly good road from Wendendale, the most important town on the operated line of the railroad, 45 miles to the south.

Wendendale, from its convenient location as regards Pinetahachi pass of the Harqua Hala mountains, and the Cunningham pass of the Harcuvar mountains, through which access to the eastern half of Yuma county is had, has become a supply point of importance. At the Colorado river terminal of the road a town has been started, and it is likely that several distributing centers will be established between Salome and the river. At Wendendale (railway station, Wenden) the Wendendale Gold Mining Co. has in contemplation the erection of a sampling plant to facilitate the shipping of small lots of copper-gold and gold ores now available in the several tributary districts.

From the Cunningham Pass section several shipments to the Humboldt smelter have been made, one lot of 18 tons from the M. E. Josephi property returning $500, the ore carrying 15% copper and $12 gold. Several other companies and individuals are making ready small shipments.

From the Oregon-Gilt Edge group of the Arizona Gold Mining Co., of which Dr. O. L. Geer of Martinez is manager, a shipment of high-grade ore is being sacked. The property is in Maricopa county, four miles south of Golden station on the railroad.

In the Harcuvar mountains, and reached from Bullard station to the east of Golden, is the Bullard mine, in which large bodies of ore that carries 7 to 10% copper and $10 in gold and silver are said to be opened. It is owned by the Bullard Brothers of Martinez.

The Socorro Gold Mining Co.'s mine is eight miles southwest of Wendendale. It is equipped with a 20-stamp amalgamation - concentration - cyanidation plant, which is in operation under direction of Manager F. C. Smith. This property is to the north of Harrisburg, while the Harqua Hala mine, which is again to be worked, lies six miles to the south. The postoffice of the Bill Williams' Fork country is Planet.

A partial list of developing properties in regions tributary to the A. & C. railroad is here appended: Signal Copper Co., Newton Evans, manager; Wendendale Gold Mining Co., O. E. Young, manager, and H. B. Hanna, assistant manager; Oro Cobre Gold & Copper Co., Mark Murphy, manager; Bullard Copper mine, Bullard Brothers; Victor and Belle Crown Mining Co., R. R. McDonald, manager; Della group, L. B. Pouge, owning operator; Liberty Gold & Copper Co., Frank Burns, manager; Clara Gold & Copper Co., J. E. Rodgers, manager; National Gold & Copper Co., Wolfram Copper Co., Continental Consolidated Mining Co., Ben Blanchard, manager; Planet Mining Co., D. Jones, manager; Josephe Torres group, Keyes group, San Marcus-Salome Development Co., W. S. Pratt, manager; Socorro group, Dr. O. L. Geer, owner; Mount Straub group, Aker Brothers; De Monte group, Mineral Belt, and Indian Queen groups, operated by O. L. Geer; American Mining & Smelting Co., and Amalgamated Gold Mines Co., O. A. Pease, manager.

A stock exchange was organized in Prescott March 12, and steps taken to equip offices and to operate a strictly up-to-date exchange, giving particular attention to stocks in the Southwest.

Prescott, March 19.

At the Cleopatra, General Manager Hull is grading for the new smelter. The work now being done in the mine is giving satisfactory results. —— General Manager C. W. Clark, of the United Verde, says that within one month his company will have another large furnace completed and at work. Mr. Clark also says they have been bothered by bad coal and they are considering the use of oil.

CALIFORNIA.

Calaveras County.

It is reported that the Penn copper mine, near Campo Seco, is to be connected with the railroad by a spur built from Burson, near Valley Springs.

It is reported that the Gwin mine is looking better than at any period in its history. Last month the gross output was nearly $50,000, and a dividend of 25c. per share declared. The improvement in this property is having an important influence on mining in that section, both on the Amador and Calaveras side of the Mokelumne river.

Oliver Rodgers & Co., of Boston, have secured control of the Lloyd mine at Central Hill, four miles west of San Andreas. The property is equipped with a 60-h.p. boiler, hoist and mill, and with nearly all the machinery necessary to handle 100 tons of gravel a day. A new pump will be installed. In sinking the incline shaft they struck the Round Wash channel nearly in the center, and a crosscut was run, and 100 feet of drifting done, proving the channel at this point to be 240 ft. wide and the gravel from 10 to 12 ft. deep. There is nearly a mile of the Round Wash channel on this property, and wherever this channel has been struck it is reported to have been rich. The incline shaft has been re-timbered and some work done on the shaft which taps the Flat Wash channel, and a good prospect of gold is being found at the foot of the shaft. The Flat Wash channel has never been a wide channel, but the wash has been rich, loose, uncemented gravel that does not require milling.

Kern County.

The independent oil producers of the Kern river and Coalinga fields are planning for a shut down in order to obtain better prices for their products. Many contracts between the producers and oil companies will expire in May, and it is expected that the move to shut down will begin then. The present price of petroleum in the two fields is about 18 c., and it is expected that the lessening of the output will result in doubling the price.

Nevada County.

Howard & Kemp report having discovered a ledge near French Corral which can be traced for over 3,000 ft. Samples broken off the croppings show free gold in nearly every instance. On the surface the ledge is 18 in. wide. The owners will drive a tunnel into the hill to strike the vein at depth. The ledge is in slate.

Clyde Cole and W. L. Williamson, working in the Giant King mine near Washington, running a tunnel on the vein had got in a distance of five feet when they struck a bad piece of ground. While they were at work driving ahead a cave occurred, catching both men. Williamson was covered with debris to the shoulders, while Cole was pinioned down, a large piece of rock striking him on the leg. Williamson battled bravely to extricate himself and after doing so dug Cole out.

Sinking of the Empire shaft, near Grass Valley, has been resumed.

Placer County.

It is reported that the Pioneer mine, situated near Damascus, has been sold to J. B. Hobson. The Pioneer is one of the oldest quartz mines in the county. During the last few years little work has been done on the property. It is equipped with a 20-stamp mill.

At the Three Stars mine, seven miles west of Auburn, 40 more stamps are to be installed. —— The Eclipse-Morning Star group will start soon. —— The Bullion group, near Auburn, it is reported, is to be taken over by a San Francisco firm. These claims are to the east and north of the Bellevue, which is now producing good shipping and milling ore.——Malmberg's mill is running on custom rock, and there is a good prospect of both the St. Patrick and Pioneer mills being put in running shape. —— The Hathaway is overhauling its machinery awaiting the new machinery to be installed.

San Bernardino County.

The strike made by a man named McClure, 17 miles south of Needles, and another near Vontrigger, along the Santa Fe branch line between Goffs and Manvel, are attracting much attention. Both gold strikes were made in February and made public through the visits of locators to the mills at Needles. The facts became public, when there followed a general scramble, and 1,200 prospectors swarmed into Vontrigger, and nearly as many joined the rush to the McClure district. The ore in the Vontrigger district is iron-stained and free milling. Water is hauled from Lucky Dog Springs, about a mile and a half from the original location. At the McClure camp the ore taken from a shallow hole in the ledge assays $640. The ledge is seven feet wide. At Vontrigger the original discoverers, it is reported, have bonded their claims to a syndicate of Searchlight capitalists for $150,000. In the McClure field the original locator leased his claims to other miners, who paid $2,000 for a long-term lease.

Preliminary work was begun on the 20th inst. by the Santa Fe, on a branch line from Barnwell to Searchlight, Nev., and the work of construction will be started in a few days. The new line will follow the route of the present stage line between the two towns, although in places a considerable distance will intervene. The total length will be 23 miles. It will be completed, the officials say, by August 1st.

Tuolumne County.

The Dead Horse and Lady Washington mines at Carters are to be re-opened. Superintendent P. M. Teague is repairing the boarding-house and bunk-houses on the Lady Washington. On the completion of this work mining operations will be commenced. The company will work these properties through the Lady Washington tunnel.

COLORADO.

Fremont County.

The Dorcas custom ore mill, half a mile north of Florence, was destroyed by fire Monday afternoon. The mill was built six years ago and was valued at $300,000. It was owned by the Dorcas Mining, Milling & Development Co., and treated Cripple Creek ores exclusively.

Ouray County.

A contact has been opened up on the Black Girl, near Ouray, which carries 20 oz. silver. There is also another contact which carries 16 oz. The Black Girl is located less than half a mile north of the Newsboy. One of the contacts is below the lime, the other above it. The contact carrying the higher values is 5 ft. thick. A 50-ton shipment was made a short time ago. Over 400 ft. of the contact has been uncovered and there is from 8,000 to 10,000 tons of ore in sight. Mr. Dupraw will let a contract for the erection of a number of ore-bins for the storage of ore, and work, which had been temporarily suspended, will be commenced with 10 men.

San Juan County.

It is reported at Silverton that the Mountain Queen mine was swept by a snowslide Saturday and all the buildings, including the compressor-house, destroyed. Twenty men escaped without injury. The financial loss is not heavy, as the company had not installed the expensive improvements planned. The Mountain Queen is situated in California gulch, over the ridge from the Sunnyside and Gold Prince properties.

A large party of men left on the 21st on snowshoes for the Shenandoah mine, in Arastra gulch, above Howardsville, to assist in digging for bodies of the twelve miners who were swept to their deaths by a snowslide. Still another party is on its way to Green Mountain mill to search for the body of Foreman D. R Hickey. Considerable alarm is felt for the members of these rescue gangs, as they will be compelled to go over trails where snowslides are frequent.

Slides have been running with dangerous frequency in every direction for the last week, but it was not until Saturday that lives were lost. The property loss has been heavy. Scores of miners and other mine employees have had narrow escapes from being carried away and killed and several persons have been injured. The first slide of importance to come down was early in the morning on King Solomon mountain, which destroyed the boarding house at the Unity tunnel, and Nels Hansen, the cook, had his leg broken. About 75 men are employed at the tunnel, which is part of the Silver Lake property, situated a few miles from Silverton.

The slide continued down the mountain 300 feet and struck the Last Chance workings, a part ot the same property, where five Italians were employed. There it demolished the bunk-house and carried away one of the cabins.

Below the Last Chance the slide struck a little cabin in which was Mrs. Johnson, wife of one of the employees, near the bottom of Arastra gulch, and after tumbling the house upside down several times, landed it safely in the gulch and Mrs. Johnson only received a bad shaking up.

The second slide came down at noon and practically demolished the Green Mountain mill, which has just been installed at a cost of over $300,000.

Summit County.

(Special Correspondence). — A company has been organized in Denver, with the title of the John A. Holmberg Mining & Milling Co., of which State Treasurer John A. Holmberg is one of the principal figures, to work a group comprising 146 acres of mineral ground on McCulloch mountain, six miles southeast of Breckenridge. This property has shown up well in the work done on it, and has made shipments of ore which returned $14 to $18 gold, as well as silver and lead values. The main tunnel is to be driven from the creek level.

The Gold Dust Mines Co. is pushing development in

the main tunnel, beyond the 3,000-ft. point, and the vein is improving.

The Germania mine, under lessees, is shipping gold-silver ore. The shipments are going through the local sampling works.

The Rothschild tunnel at Argentine is now in 3,500 ft. and Manager Thomas Webb is daily expecting to cut the Traffic vein, one of the two large high-grade veins for which this tunnel was started. The other vein is the Rothschild, and should be met within 100 ft. after the Traffic is cut. Mr. Webb intends to drift along the vein which was cut at the 2,850-ft. mark and ship from it. Part of this orebody gives high assays in silver.

The Stoughton Mining & Milling Co., a Wisconsin corporation, operating the Carrie mine on Wise mountain, intends to enlarge its cyanide plant as soon as the weather will permit. In the raise from their main level there is a 4-ft. ledge of pay ore. A new tunnel will be started to the vein from the mill level, and to cut all the known veins at depth and save hauling to the mill.

Breckenridge, March 17.

Teller County.

A five years' lease, with bond of $300,000, has been granted by the directorate of the Index Mining & Milling Co. on its estate on Gold hill, of 27 acres, to Dr. Hereford, Phil Knowlton and Captain Cavanagh. The lease, it is learned, will be transferred to the Ætna Investment & Development Co., a corporation to be organized.——W. P. Sellors, who secured a three years' lease on the Yellow Bird, on the west slope of Gold hill two weeks ago, and a few days after struck a three-foot vein of five-ounce ore at the 150-ft. level south of the shaft, is constructing a new shaft-house and erecting ore-bins. A steam hoisting-plant has been ordered, and as soon as the machinery is installed shipments will follow.

IDAHO.

Owyhee County.

Work has been suspended on the Trade Dollar Extension, it being impossible to get timber and lagging to the mine owing to the condition of the roads. C. W. Hill, who has been east all winter in the interest of the Stormy Hill group of mining claims on War Eagle mountain, is expected to resume work on the property shortly.——C. E. Kingsley, who has the contract for running 300 ft. of tunnel on the Banner property, measured 80 ft. for the month, leaving 50 ft. to go on his contract.

H. M. Stevens, of the Rich Gulch mines, says they are getting their bins filled with fine-looking ore—some of it rich in silver—but that they are having difficulty in getting timbers and the wet ground they are working in requires considerable of it.

Shoshone County.

Superintendent Davis of the Gold Ridge Mining Co., reports assays from the recent strike in the 80-ft. shaft on the company's claims, six miles east of the head of navigation on the St. Joe river, to show 12% lead, 5.4 oz. silver, .29 oz. gold; total $21.24; a second assay, 2.2 oz. silver, 3.08 oz. gold, total $65.02. The last assay was taken from the bottom of the shaft, six feet into the ledge just struck. Mr. Davis says that by the 1st of April he will be able to take in hoisting machinery and blowers. A new boarding-house is being built and will be completed by the time the machinery can be taken in.

MONTANA.

Beaverhead County.

The Calumet & Montana Mining Co., composed of Michigan and Montana men, has taken over six full claims in this county and intends to develop them. There are two tunnels on the property, one of which is 125 ft. long and the other 160 ft. They are 60 ft. apart. It is claimed there are five feet of copper ore in the upper one, and that a shipment to Salt Lake gave $66 in gold, $4 in silver and 18% copper. The district in which the property is situated is known as the Copper Queen.

Granite County.

Manager G. H. Savage of the Milwaukee Gold Extraction Co., in Red Lion district, has returned from a month's visit to Chicago and Milwaukee, and says work in the mines, which was suspended in January, is to be resumed. The company had decided to install machine drills, and work will be commenced in a tunnel 300 ft. from the mill to open the Hannah mine at a depth of 700 ft. Machinery, including power-drills, pipe, etc., is en route and will arrive in about a week. A compressor is already installed at the mill and this is to be employed in operating the drills in the tunnel. The water supply of the mill has been frozen up since early in the winter, but a spring near will furnish sufficient water for the boilers to run the air compressor. It will be several months before the mill can be started. The Hannah vein is 60 ft. wide, and beside gold carries 40% iron and traces of copper. Down nearer the water level the copper becomes more pronounced. During the coming summer Mr. Savage proposes to install a hoist and pumps and sink several hundred feet on the lead.

Silver Bow County.

The Pittsburg & Montana Copper shipped a carload of copper Saturday, making the second shipment this month, making nearly 50 tons. It is raising all the ore the plant can handle and keeping a good supply on hand.——A vein of silver-gold ore has been struck on the 500 ft. level of the Blackrock mine and shipments made from it. The ore contains some copper. The shaft on this property reached the 500 mark a short time ago. A. P. Peake of Valley City, N. D., is president of the company.

The Butte & Bacorn Co. developing ground at Horseshoe bend, north of Meaderville, is making good progress. All of the shafts, four in number, are about 65 ft. deep, and two will be sunk to an indefinite depth.

It is expected that the converters at the Butte reduction works will be ready for business between April 15 and May 1. They a e practically in place now, but some other work will have to be done before they can be used. They are taking the place of the blister copper furnaces which were installed as an experiment about three years ago.

NEVADA.

Esmeralda County.

The Contact Gold Mining Co. has been formed by J. H. Mitchell, J. H. Miller, G. S. Green, J. E. Adams, Eugene Ferretta, H. F. Launtz, A. Miller and G. P. Geyer to operate the mines of this company, adjoining the Wild & Pardini ground in North cañon, seven miles south of Hawthorne. The Contact company owns eight claims in one group. There are several ledges exposed which pan free gold, and assays run from $5 to $50 on surface rock. The directors of the company are J. H. Mitchell, J. S. Calvert, J. H. Miller, A. Miller and G. S. Green.

Gilbert Briggs is interested with others in a group of claims in Huntoon Valley, 40 miles south of Hawthorne. The country is cappedwith porphyry, which makes prospecting difficult. The ledges are strong, some of them run in as high as $150 per ton. The samples shown are honeycombed quartz, showing galena, which runs high in silver. The gold values are principally in iron oxide. A company of Oakland capitalists is opening properties in Huntoon, and the Lee brothers are taking out specimen ore.——L. Bacigalupi has struck a 4-ft. vein of $30 ore on the Millsap claim in North cañon. This mine is now the property of DeChambeau, Dondero and Bacigalupi.

Humboldt County.

Thirty-five miles northwest of Lovelocks is a mining district known as the Seven Troughs. This section has lately attracted attention owing to good assays and pannings from claims owned by J. Therien, W. Stautts, A. Borland and F. Crumpacker. It had not been prospected because it was a porphyry formation and had little showing of the kind of quartz supposed to carry values. The discoveries in the southern part of the State set the prospectors to looking for gold in porphyry, and some who had been to the southern camps remembered the Seven Troughs district to be similar and went there to search for the yellow metal. W. Stautts and J. Bishop prospected the cañon, by panning, from its mouth up to the troughs, getting colors up to that point but none above. At the troughs a big porphyry dike crosses the cañon and careful prospecting showed it to contain rock assaying from $12 to $50.

Lincoln County.

(Special Correspondence).—The Cyrus Noble mine is still sinking in ore. The management is sinking to a depth of 1,000 ft. Four shifts are employed. The mill is running on $80 rock and when the water pipes being laid are all connected three shifts per day will be put on. A shipment of bullion will be made from the Cyrus Noble in a few days and a dividend will be paid in April. The electric plant is installed and wiring is progressing rapidly.

The recent investment of Eastern capital in the Parallel has resulted in a renewal of activity in sinking a 200-ft. shaft from the 300-ft. level and several hundred feet of drifting and crosscutting. It is one of the best located mines in the belt. Lack of capital had rendered anything but desultory work impossible heretofore. A large force will be put to work and the mine thoroughly developed. Two shifts will be employed at first. Robert Lanka is consulting engineer. The Parallel is situated immediately north of the Cyrus Noble mine, west of the Santa Fe, and south of the Big Six and Southern Nevada groups. The mine has produced ore that ran several hundred dollars per ton.

Owing to the unexpected flow of water on the Black Hawk of Le Roy Mining Co., work has been suspended until the installation of a pump. The shaft is down 275 ft. and drifting will be started above the water level.——The 10-h.p. hoist of the Treasurer Co. is now in operation and the shaft is to be sunk to the 250-ft. level. At present they are down 35 ft. in ledge matter, and good pannings are obtainable anywhere. This property is situated on the townsite, and the strike was made on the corner of Main and Haviland streets.——The Mountain group is still absorbing all the interest in El Dorado district, as the work of sacking ore continues on the Lela B. of that property. The rich streak is two and one-half feet wide. It was encountered in running a 15-ft. open crosscut.

The El Dorado-Nevada is proving the width of the ledge on the Silver Legion. It has been crosscut nine feet without finding the foot-wall. A sulphide ore has been opened up at 150 ft. that is richer than the rock found at the 100-ft. cut.

The Nevada Consolidated Mines, Ltd., have purchased the McGhan & McLaughlin group, consisting of 20 claims, in the Sunrise district, for $250,000. George P. Spittall, of Philadelphia, is at the head of the company, Marius de Brubant, general manager of the Salt Lake route, is a director, and represents a syndicate of Montana capitalists who have invaded southern Nevada in search of promising mines. Machinery is on the way to the property, and when it arrives three shifts will be put to work, supplementing the force of 45 men now employed. Contracts have been let for sinking shafts 350 ft. each.—— Water has been struck on the Boulder at a depth of 175 ft. and pumps are to be installed. Drifts have been run at 65 and 165 ft. and a body of free-milling ore has been found. Sinking will be resumed to the 400-ft. level as soon as the shafts have been relieved of the water.

Searchlight, March 17.

Storey County.

A new rock-breaker has been installed at the head of the chutes leading to the C. & C. ore-house. All of the second-grade ore hereafter sent to the Kinkead mill for treatment from the Consolidated Virginia and Ophir will be run through this breaker. A rock-breaker has been used for years in crushing the coarser first-grade ore before dumping it into the bins, but does not pulverize as it is reduced by the new breaker, and unless the entire bulk of ore as it comes from the mines is well pulverized, it is impossible to obtain a reliable average of its assay value, as the coarser rock may or may not carry the highest percentages in gold and silver. The new breaker will be operated by electric power.

NEW MEXICO.

Santa Fe County

At Cerrillos, the new concentrator on the Cash Entry is about ready for active operations. It will have a capacity of 50 tons daily and will be run day and night if the ore supply holds out. The company which owns this concentrator has recently purchased a number of mining claims in Hungry Gulch and other properties in the district, and the manager is of the opinion that there is plenty of ore in the vicinity to supply the concentrator.

D. C. Allard, who is mining on 70 acres of land east of Santa Fe, within the Santa Fe Land Grant, which he purchased from the city of Santa Fe four years ago, has recently struck a vein bearing zinc, gold and silver. The ledge is 40 ft. in length and 10 ft. in width as far as exposed. The assays show $60 zinc, $10 gold and $5 silver. Mr. Benson, who represents David H. Moffat, of Denver, has made his report, and negotiations for the purchase of this property are in progress. The Gibson Development Co. of Santa Fe has claims west of the property owned by Mr. Allard and an extension of the ledge above referred to was found at a depth of 60 ft. on their property. Last year a small force worked several months on this development. This spring this company will continue operations, as soon as the weather settles. The Moffat syndicate is looking for zinc mining property in New Mexico. Mr. Allard and associates have discovered another body of zinc ore in the Tesuque Box cañon, six miles north of Santa Fe. Development work on these claims has been done.

At the Junction, the new engine is ready for work. Construction of the new steel frame at the Junction has begun. On the 900 and the 1,000 ft. levels development is encouraging, and as soon as the new head-frame is ready, sinking will be resumed. A large block of ore has been exposed in the Junction drifts. On the 900 drift two ore bodies have been cut. The first in close proximity to the shaft on the north. This was passed through and at 71 ft. from the shaft, in the same direction, the second body was encountered lying almost horizontal with a dip to the north. The drift cut through this orebody for a distance of 40 ft. On the 1,000 a drift is being run in the same direction to intercept this orebody. On the 900 a second drift is being driven east in leached material with favorable indications.

At the Briggs shaft a drift is being driven from the winze which is 175 ft. below the 910 ft. level, 600 ft. from the shaft in a southeasterly direction. An orebody was encountered in a drift from this winze several weeks ago 100 ft. below the 910 level of the shaft. At the bottom level of the Briggs shaft a drift has been started north from which two crosscuts have been run, one in the direction of the Hoatson and another toward the Junction. This territory is to be developed. At the Irish Mag shipment of ore continues to the smelters as usual, and the production for March will be in excess of the February production. Shipments from L. S. & P. and P. & D. have been gradually increased during this month. At the Oliver the principal development work has been confined to a drift south on the Buckeye claim from the 1,150 level. This drift has encountered a large body of fine ore.

SOUTH DAKOTA.

Lawrence County.

The Horseshoe Co., at Terry, continues shipments of smelting ores to outside plants, and, pending the construction of the new mill at Pluma, good production is being maintained at 100 tons a day, nearly all of which comes from the Ben Hur mine. Plans for the remodeling of the Kildonan mill, at Pluma, are completed, and construction will commence in a few days.

The Homestake Co. has presented a cabinet of specimens of characteristic ores to the State School of Mines at Rapid City. The specimens include samples from every level from the surface down to the 1,400-ft. workings. They are set in cement molds, and include porphyry, quartz, talc, and all the gold-bearing minerals of the mine.

Superintendent O. N. Brown of the Spearfish Co. says that during February the mill handled 5,949 tons in 26½ days. Working at this capacity, the Spearfish is enabled to handle a low grade of ore at a slight margin of profit. At present the company is exploring the Metallic Streak ground, where high-grade ore was mined in the early history of the camp. A tunnel is being run to develop a section of virgin ground in this neighborhood. Chances are good for the discovery of pay ore in this vicinity. The company is preparing to explore the deeper formations next summer by the aid of a diamond drill. Several holes will be sunk to quartzite—a distance of probably 600 to 700 ft.—and the ore horizon explored.

Pennington County.

(Special Correspondence).—C. O. Bartlett of Cleveland, Ohio, has taken up the option on the Clara Belle Mining Co.'s property, Oreville, the control passing to him and his associates.

About $30,000 have been spent on this property during the last nine months in building new houses, putting in a saw mill, a new shaft-house, new 10-stamp mill, compressor and drills, boilers and engines, sinking the shaft, driving tunnels, etc. Samples of ore were sent to Fueller, of Denver, and running tests made on ore taken at a depth of 250 ft., which yielded $44 per ton, 75% of which was saved on the plates, and the balance up to 94% by cyanide.

The small 2-stamp mill has been running since October, and will continue to run until the 10-stamp mill is finished about May 1. The small mill is turning out over $100 daily from the plates. The tailings are being stored for future treatment in the new mill. A new shaft will be sunk to tap the orebody at a depth of 500 ft. At a depth of 250 ft. the ore-shoot was 27 ft. long and from three to five ft. thick. At 300 ft. it had increased to over 100 ft. in length and from four to eight ft. thick and richer in free gold.

There are good reasons to believe that this property will prove to be one of the best mines of the Black Hill-.

It consists of about 200 acres, one and one-half miles from Oreville, with plenty of good timber and water.

Oreville, March 17.

Men are employed at the National smelter, at Rapid, on repairs and other work incidental to the blowing in at an early date. With the completion of the M. R. & N. W. road, which will give connections with the Burlington at Mystic, and a connection with the mines of the Northern Hills, the mill will be started. It is planned to operate one furnace at first, and as soon as business warrants the capacity will be increased. The plant will treat 100 tons of ore daily. Arrangements have been made for deliveries of coke, limestone and pyritic flux—the latter coming from Colorado. Several of the mines of the Northern Hills will ship a large portion of their ores to the plant.

WASHINGTON.

Ferry County.

(Special Correspondence).—A body of iron sulphide has been encountered above the No. 2 tunnel level of the Copper Key mine. The raise, 4 by 6 ft., is all in ore, the assays showing an ounce of gold, a little silver and a small quantity of copper per ton. The strike is of importance on account of the excess of iron contained. The working force is being increased, putting the mine in shape for stoping, in view of railroad transportation direct from the mine. On the main (No. 2) tunnel level a drift is being driven to get under surface orebodies, from which a hundred carloads have been sent to the smelters. The Oversight group adjoins the Copper Key on the southwest and is being developed. The Anonymous group adjoins on the northeast.

The Richey Mining & Development Co., of Pullman, owns the Frisco Fraction group on Iron mountain, eight miles east of Republic. A tunnel is being driven under contract. It is expected to tap the vein 110 ft. from the portal. The ore assays six per cent copper, with gold and silver to a total value of $100 per ton in the best ore.

Ore is being shipped from the Ben Hur mine as fast as the smelters at Trail and Greenwood, B. C., will take it.

The Pearl Consolidated Mining Co. has started to raise and sink on pay-ore from the 190 level of the Lone Pine. All of the second-class ore on the dump has been shipped to the smelter.

The shipments of silicious ore from the Quilp amount to a carload a day. The mine employs fifteen men.

Republic, March 17.

Township 37 and 38 north, range 32 east, Willamette meridian, to be opened for filing April 16, are situated, relatively, north of and adjoining Republic, and are bounded on the west by the east boundary line of Okanogan county. The Quilp, the Morning Glory, the Lone Pine, the Pearl and the Surprise group, the San Poil, the Blacktail, the Ben Hur, the North San Poil, the Trade Dollar, the Knob Hill, the Mountain Lion and other leading mines of this district are situated in these townships, as also are the Empire and a part of Sheridan camp.

Okanogan County.

(Special Correspondence).—The Copper World Extension mine, on Palmer mountain, is developing iron sulphide ore in the 200 level. The south crosscut has crossed several small veins of ore and one orebody 23 ft. wide. The ore carries gold, silver, and copper.

The Grand View Mining Co. has tested its new electrical machinery, the Riblet aerial tramway having previously been in operation and the bins at the lower terminal filled with ore. The machinery ran satisfactorily. Only a small force of miners has been employed. Several weeks may elapse before the stamps begin dropping and the ore reserve is large enough to ensure a continuous run. It is reported that the Copper World mine will soon be in operation.

The latest development at the Phil Sheridan mine, of Sheridan, is a new body of ore encountered in the south drift on the vein, on No. 1 tunnel level. The ore is of good quality. The old stope has been extended in length and height above the tunnel. Ore is accumulating at Lynch's siding, on the railway, for shipment to the smelter.

An open cut on the Stemwinder, 75 ft. from the Kismet of the Phil Sheridan group, has developed an orebody thirty feet deep. This is the second strike made on the Stemwinder this season.

The Viola Gold and Copper Mining Co. has a group of claims on Eneas mountain, in Galena district, 17 miles south of Loomis. They cover 140 acres on the south slope of the mountain, and carry veins of gold, silver, copper and lead ores. Some of the lead ore is rich in silver, and the gold and copper values are good. Joseph Coleman, the local manager, recently stated in Republic, that the company expects shortly to install machinery.

The contract for driving 100 ft. on the No. 2 and 100 ft. on the No. 3 tunnel level of the Bodie mine, at Bodie, has been completed and men have since gone to work on optional contract on the No. 2 level.

Loomis, March 17.

Stevens County.

(Special Correspondence).—The Hibernia Mining Co., in Pierre Lake district, has been open cutting on two veins, one of them 24 ft. and the other about 100 ft. wide. The former is low grade in gold but some of it paying to ship. The latter is a contact between porphyry and rhyolite. Three shafts, respectively 22, 35 and 60 ft. deep, have been sunk, and the latter timbered to a depth of 40 feet.

There is considerable activity in the mines of this county, although the Old Dominion mine has been idle for a year and a half. The Copper King, in Chewelah district, has been shipping good copper-gold ore lately. Several properties have been bonded, the main incentive being the shipment of gold ore, which in the past year amounted to $180,000 from the First Thought mine, twelve miles from Orient, in Pierre Lake district.

The marble industry in Stevens county is increasing. The Standard Marble and Onyx Co. is making preparation for large output from its quarries, five miles east of Colville. The Crystal Marble Co. is operating quarries west of Addie. The Kettle River Marble Co. is operating at Barstow, and for the last six months the Jefferson Marble Co. has been opening up its quarry. Across the river, in Ferry county, there is a long stretch of country that will probably be operated, and within five miles of Danville marble is abundant, but still in the hands of small owners.

Colville, March 17.

WYOMING.

Carbon County.

The Stemp Spring Coal & Power Co. is preparing to erect a 250-ton smelter, including a matting furnace and concentrating plant, at Dillon. The plant will be erected on the south side of the grounds of the Jack Pot Mining & Milling Co. and the Anchoria Copper Mining Co., within reach of every mine and prospect of the Battle Lake Mining District. Within short haul of the smelter, hundreds of tons of copper ore lie on the dumps of mine and prospect. The Pluto, Independence, Batchelder, Congo Itmay, Azurite, Jack Pot, Anchoria, Oshkosh-Wyoming, Judith, Toronto Girl, and other properties in the producing stage of development, are awaiting the smelter. Contracts are now in possession of the Smelter Co. sufficient to guarantee a steady run to its fullest capacity for months.

Near the site of the smelter a water power, owned by the Jack Pot Mining & Milling Co., has been leased for twenty years by the Smelter Co. With this water a power plant, to be erected at the company's coal mines, will furnish light and power to the various mines of the district.

FOREIGN.

CANADA.

The Geological Survey of Canada reports the production of metallic substances in the Dominion during 1905 as follows:

Product.	Quantity.	Value.
METALLIC.		
Copper ..... Lb	47,597,502	$7,420,451
Gold, Yukon $8,327,200		
Gold, all other 6,159,633		
		14,486,833
Iron ore (exports, estimated) ..... Tons	116,779	125,119
Pig iron from Canadian ore ..... Tons	70,554	1,047,860
Lead ..... Lb	55,961,000	2,634,084
Nickel ..... Lb	18,876,315	7,550,526
Silver ..... Oz	5,974,875	3,605,957
Cobalt	.....	100,000
Other metallic products, including zinc	.....	180,000
Total metallic	.....	$37,150,830

The production of non-metallic products is officially given as follows:

Product.	Quantity.	Value.
Asbestos ..... Short tons	50,670	1,486,359
Asbestic ..... Short tons	17,594	16,900
Chromite ..... Short tons	8,575	93,301
Coal ..... Short tons	8,775,933	17,558,615
Corundum ..... Short tons	1,644	149,153
Felspar ..... Short tons	11,700	23,400
Graphite ..... Short tons	541	17,032
Grindstones ..... Short tons	5,172	57,200
Gypsum ..... Short tons	435,789	781,543
Limestone for flux in iron furnaces. Short tons	341,614	258,759
Manganese ore (exports) ..... Short tons	22	1,720
Mica ..... Short tons	.....	168,043
Mineral pigments—		
Barytes ..... Short tons	3,360	7,500
Ochres ..... Short tons	5,105	34,675
Mineral water	.....	100,000
Natural gas	.....	314,249
Petroleum ..... Bbl	634,095	849,687
Phosphate ..... Tons	1,300	8,425
Pyrites ..... Tons	32,744	123,574
Salt ..... Tons	45,370	310,858
Talc ..... Tons	500	1,800
Tripolite ..... Tons	200	3,600

BRITISH COLUMBIA.

Vancouver Island.

During February the Tyee smelter ran 13 days and treated 2,224 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $34,402.

Yale District.

For two weeks there have been reports of strikes in Le Roi mine. It is reported that the strikes are the most important made in Le Roi in the past eight years. What appears to be the most important strike, was made west of the Josie dike. In Le Roi territory, the section west of Josie dike, which comprises lengthwise about one-half of all the territory of Le Roi, there has been found a body of high-grade ore, which has been drifted on for some distance. The drift is five by seven feet, and is in ore for all the way. Its width is not yet known, as it has not been crosscut. The second strike in point of importance was made on the 600-ft. level, where an ore-shoot of 20 ft. in width has been found. This shoot is opened 50 ft. in length. The ore in this shoot is of good grade. The third strike is reported to be on the 1,050-ft. level. This is a narrow shoot of high-grade ore. On the 1,650-ft. level in a crosscut north from the winze ore has been located which has been crosscut for 20 ft. A fifth strike has been made near the surface of what is supposed to be a portion of what is known as the Peyton shoot, at one time the richest in the mine. Andrew Larson, the superintendent of Le Roi, conceived the idea of running a crosscut on the 800-ft. level across the 80 ft. of the Josie dike, who found the shoot in the new territory.

Eric Stevenson and associates have leased the O. K., at Rossland, and during the week put 30 tons of ore through the mill. The result was a gold bar worth $300 and two tons of concentrate worth $100 a ton.——Following are the shipments for the week: Centre Star, 3,660 tons; Le Roi, 2,430; Le Roi No. 2, 720; O. K. (crushed), 30. Total for the week, 6,840 tons, and for the year to date, 66,255 tons.

Shipments from Boundary mines for the week ending March 17 were as follows: Granby mines to Granby smelter, 17,014 tons; Mother Lode to B. C. copper smelter, 3,172; Brooklyn Stemwinder to Dominion smelter, 2,706; Rawhide to Dominion smelter, 510; Oro Denoro to Granby smelter, 756. Total for week, 24,108 tons; total for year, 264,397 tons. The Boundary smelters treated as follows: Granby smelter, 18,236 tons; B. C. Copper Co. smelter, 4,353; Dominion Copper Co. smelter, 3,336. Total ore treatment for week, 25,920 tons; total for year, 273,313 tons.

Total ore shipments for the past week from all mines in the Yale-Kootenai district amounted to 31,883 tons, and for the year to date 360,083 tons. Slocan-Kootenay shipments were small, owing to the late blizzard, but totaled 1,391 tons, and for the year to date 22,052 tons. The principal Slocan-Kootenay shippers were the St. Eugene, 549 tons; Sullivan, 500; Hunter, 180; Sunshine, 40; other mines, 122. Three new shippers—the Majestic, Molly Hughes and Sunshine—were added to the list, making a total of 70 shipping mines this year over the whole district.

Owing to the severe frost of the past week, J. W. Jones, who has the contract for building the Great Northern spur into the Belcher mine, on the reservation near Curfew, has had to discontinue work, but had the grading sufficiently advanced to enable the management of the Belcher to unload several carloads of rolling stock for the mine, including engines, ore-cars, etc. The Belcher is working about forty men and will increase that number as soon as this railroad spur is completed, in about a month's time.

MEXICO.

Chihuahua.

(Special Correspondence). — Geo. M. Ryall, accompanied by Forbes Rickard, and a party of six other Americans, and escorted by 18 rurales with two officers, left La Colorada on the 16th inst. for La Dura and Barranca, in the Yaqui river region. Indian depredations continue and Yaqui raids are more frequent than ever. It is foolhardy to go into the Yaqui country without an escort. The party referred to above expect to return to La Colorada in 10 to 12 days, or possibly later, should they decide to go on to La Bufa. Geo. M. Ryall has two concessions, bounded by the Rio Tecoripa on the west and the Rio Yaqui on the east. They cover an area of nearly 2,000,000 acres and take in much valuable mining property. The Cananea, Yaqui River & Pacific Railroad, building under the Southern Pacific Railroad, with Col. Epps Randolph president, is laying rails to La Bufa, under forfeit to complete this branch to La Trinidad this year. The railroad will traverse Mr. Ryall's concessions for more than 50 miles and tap the anthracite field at Barranca. With the conveniences afforded by this road, and the cheap fuel, it is thought the mineral territory, much of which was worked by los antiguas, will be rapidly developed, as it will then be much easier to work out the several metallurgical problems now involved in the handling and treatment of the silver-copper ores of this district.

La Colorada, March 16.

H. N. Jackson, manager of the Santa Eulalia Exploration Co., is completing the new hoisting plant at the company's mines in Santa Eulalia.

NOVA SCOTIA.

The gold mine recently started at Middlefield, 15 miles from Liverpool, caved on the morning of the 15th inst., burying four men. The body of one man has been recovered, but the work of unearthing the others had to be abandoned, as the pit started to cave in again, and 50 tons of earth covers the other three.

PHILIPPINE ISLANDS.

H. D. McCaskey, chief of the division of mines at Manila, says there is much mining activity in the Aroroy district of Masbate. The Philippine Mining Co. is operating a dredge on the Lanan river, and Manager F. Kimbal is in the United States to get two more dredges to be operated on the same river. On the Guinobatan river, the Oriental and Masbate Co. is dredging. The Eastern Mining Co. has made a number of trial runs with its 5-stamp mill on its claim in that district. The Oriental-Masbate Mining Co. has purchased a number of claims in the same section and has put in a 10-stamp mill, which was originally for its mines at Benguet. The Coghran Mining Co., which is operating on the Upper Lanan river has ordered a 10-stamp mill.

Books Received.

'Standard Telephone Wiring' is the title of a neat handbook, with flexible covers. It is for the use of telephone men, and contains diagrams of circuits for straight lines, party lines, plans, sub-stations, and various other arrangements. A useful book for the practical man and the young engineer. Sent by the MINING AND SCIENTIFIC PRESS upon receipt of price —$1. McGraw Publishing Company, New York.

'The Wiring Handbook,' with complete labor-saving tables and a digest of the Underwriters' rules. This book, by C. P. Poole, is intended for the use of wiremen who are obliged to lay out their own work, and for engineers who make up wiring plans and specifications. As the book contains rudimentary instructions it will be valuable to the practical lineman and young electrician. Illustrated by numerous drawings. Sent upon receipt of price—$1, net—by MINING AND SCIENTIFIC PRESS. McGraw Publishing Co., New York.

'The Elements of Mining Geology and Metallurgy,' by G. W. Miller, a practical man, has been added to the list of books for the use of prospectors and investors in mines who desire information in language that can be understood without first acquiring a technical education. The work embodies many examples of actual conditions and working methods, and cannot fail to be of value to the novice. It will be sent by the MINING AND SCIENTIFIC PRESS upon receipt of the price, post-paid, $3.50. Published by the Daily Mining Record of Denver, Colorado.

A treatise on 'Producer Gas and Gas Producers,' by Samuel S. Wyer, is the latest contribution on this inter-

esting subject, which is of growing importance. The work reviews the fundamental physical and chemical laws concerning the subject, defines gases and the status of producer gas, its manufacture, use and efficiency. The book treats the subject thoroughly and completely. It is profusely illustrated. Sent by the MINING AND SCIENTIFIC PRESS. Price, $4. The Engineering and Mining Journal, publishers, New York.

Personal.

C. A. MOREING is in Western Australia.

ANTON EILERS is at Aguascalientes, Mexico.

J. NORTON GRIFFITHS is in southwest Africa.

T. M. RIORDON is at the Bully Hill mine, California.

E. C. VOORHIES is in San Francisco from Sutter Creek.

J. H. SLATTERY, of Silverton, Colo., is at the St. Francis.

S. J. SPEAK leaves London shortly to proceed to Sumatra.

W. H. RADFORD has returned from Clear Creek, Colorado.

JOHN B. FARISH has left San Francisco on his return to Denver.

BEN. S. REVETT is on his way back from Colombia to New York.

WILLIAM A. AKERS is visiting San Francisco from Los Angeles.

J. H. CURLE sailed for Japan on the *Korea*, which left on March 22.

JOHN ROSS, JR., has returned to Sutter Creek from San Francisco.

ERNEST A. WILTSEE has returned from Mexico and is now in Nevada.

C. M. YEOMANS returned from Australia on the *Sierra*, arriving March 19.

GEORGE KISLINGBURY is examining copper mines at Yerington, Nevada.

JOHN HAYS HAMMOND has been ill at the St. Francis Hotel, but he is better.

C. E. KNOX, president of the Montana-Tonopah mine, has returned to Tonopah.

H. C. WILMOT has charge of unwatering the Altoona shaft near Butte, Montana.

REGIS CHAUVENET has returned to Denver from a professional trip in Arizona.

JOHN T. OVERBURY, of the Mayflower-Bullfrog mine, has returned from Honolulu.

F. F. THOMAS, manager of the Gwin mine, has returned from Arizona to San Francisco.

H. A. LEE, of Denver, is in San Francisco, on his return from Chihuahua, Mexico.

J. TROWBRIDGE BAILEY has returned to New York; he will proceed shortly to Brazil.

PALMER CARTER is returning from South Africa for a visit home, at Washington, D. C.

THOS. J. MURPHY has been appointed manager of El Doctor mine, in Queretaro, Mexico.

PERCY MORGANS, of Western Australia, has arrived in San Francisco on his way to Mexico.

E. OSCAR HART, of New York, is not connected with WALTER SCOTT. This is stated by request.

OSCAR ROHN, manager of the Pittsburg Montana Mining Co., at Butte, is ill with typhoid fever.

J. J. CRAWFORD has returned to San Francisco from the Gwin mine in Calaveras county, California.

C. S. HERZIG has left Melbourne, on promotion to the London office of Bewick, Moreing & Company.

KARL EILERS was with the Guggenheim party at the St. Francis hotel. He has returned to Salt Lake.

F. H. JACKSON, of Broken Hill, New South Wales, arrived on the *Sierra*. He goes to Mexico shortly.

F. J. BOOTH has resigned as superintendent of the Kings Quicksilver Mining Co. and is in San Francisco.

MARK L. REQUA is leaving for New York in connection with the reorganization of the Nevada Consolidated Copper Company.

NEWTON W. EMMENS is on his way from Pittsburg to Sonora, Mexico. Subsequently he will go to the new goldfields in Nevada.

ROBERT A. KINZIE, superintendent of the Alaska-Treadwell mine, has returned to Douglas Island, after a short holiday at Monterey.

ROBERT C. GEMMELL, general superintendent of the Utah Copper Co., is making an examination of the Balaklala copper mine at Kennett, California.

A. CHESTER BEATTY is at the Silver King mine at Park City, Utah, which was recently examined by engineers in the employ of THOMAS F. COLE.

J. P. SIDWELL, president, and M. D. SHIPMAN, treasurer the Atlas Gold Mining Co., Ouray, Colo., have returned to their homes in Chicago and De Kalb, Ill., respectively.

WILLIAM G. SHARP, former manager of the Utah Fuel Company, but more recently general manager of the Somerset and Fairmont Coal Companies, has been elected president of the United States Smelting, Refining & Mining Company.

Latest Market Reports.

SAN FRANCISCO, March 22, 1906.

ANGLO-AMERICAN SHARES.

London, March 22, 1906.

	£	s	d		£	s	d
Camp Bird	1	2	10½	Oroville Dredging	0	18	9
El Oro	1	7	9	Stratton's Independence	0	7	6
Esperanza	4	3	9	Tomboy	1	6	9
Dolores	1	17	6				

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. March 22, 1906.)

Amalgamated	$106⅛	North Butte	$ 82½
Anaconda	265	Old Dominion	44⅝
Bingham Copper	38	Shannon	7¼
Calumet & Hecla	680	Tennessee Copper	45
Daly West	14	Tonopah-Nevada	18
Granby	123	United Copper	65⅝
Greene Consolidated	29⅛	United States	56¾
Nevada Con. Copper	18	Utah Copper	31⅛

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 35	Ophir	$5 12½
Hale & Norcross	1 25	Potosi	0 09
Mexican	1 15	Savage	0 59
Exchequer	0 55	Yellow Jacket	0 11

[Tonopah and Goldfield.]

Belmont	$5 87½	Montana-Tonopah	$3 05
Golden Anchor	1 30	Ohio-Tonopah	0 58
Jim Butler	1 77½	Red Top	2 05
Jumbo	1 57½	Sandstorm	1 30
Kendall	0 89	Tonopah Ex	12 00
Midway	2 30	West End	2 90

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 65¼c. per fine ounce; San Francisco, 65¼c.; London, 30½d. (standard ounce, 925 fine); Mexican dollars, 50@51c., San Francisco; 50c., New York.

COPPER.—New York (by wire, average for week ending March 22), Lake, 18.55@18.75c; Electrolytic, 18.25@18.50 Casting, 17.75@18.25c. per pound. Mill copper plates, $21; bars, 21@24c. London: £81 5s. spot per ton.

LEAD.—New York (by wire, average for week ending March 22), $5.35 per 100 lb; San Francisco, pig, 5.70@6.60c. per lb.; pipe 7¾c.; sheet, 8¾@9¾c.; London: £16 1s. 3d. ℔ long ton.

SPELTER.—New York (by wire, average for week ending March 22), $6.17@6.22 ℔ 100 lb.; London, £24 15s. ℔ ton; San Francisco, ton lots, 7c.; 100-lb lots, 7¾c.

TIN.—New York, pig, $37.00@37.25; bar tin, ℔ lb., 42½c.; pig, 39c. London, £167 12s. 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, nominal, $20@25 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$41.50, large lots; London, £7 7s 6d.; San Francisco, local, $39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 35@38c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 16c@17c; San Francisco, 1000-lb. lots, 16c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9½c; 12 oz., 8½c; 14 oz., 7½c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11¾c; 14 oz., 10@10½c; 12 oz., 9½@9¾c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3¾c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6½@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

COAL.—San Francisco, coast, yard prices to dealers: Wellington, $7.50; Seattle, $6.50; Coos Bay, $5.50; Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $14.00; Cannel, $8.50; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35; gray forge, $17.85; San Francisco, bar, 3½c. ℔ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.00 open hearth billets, $28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8½c.; less than 500 lb., per lb., 8½c.; in 25-lb. tin pails, ½c. ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ½c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8½c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17c; Astral, 17c; Star, 17c; Extra Star, 20c; Eocene, 19c; Elaine, 26c; Water White, in bulk, 10½c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24½c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 15½c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 65c; cs., 70c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 53c.; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 57c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—98@99% N. Y., $1.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

RED LEAD.—500 lb. and over at one purchase, ℔ lb., 8½c.; less than 500 lb., 8¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., 90c.

URANIUM.—Oxide, ℔ lb., $3.40.

Commercial Paragraphs.

THE Traylor Engineering Co. of New York has closed a contract for a large concentrating plant in Guatemala.

THE Main Belting Co., of Philadelphia, during the past year has built, on the latest lines, an addition to its plant, which will greatly facilitate its output and enable it to keep pace with the increased demand for its Leviathan belting.

THE Colorado Iron Works Co. recently sold and shipped impact screens to the following: Hall Mining & Milling Co., Nelson, B. C.; Sunnyside mill, Eureka, Colo.; Eleventh Hour Gold Mining Co., Spearfish, S. D.; Blake Mining & Milling Co., Denver; Wheeling Milling Co., Mine La Motte, Mo. A smelting furnace was likewise shipped to Berlin, Germany.

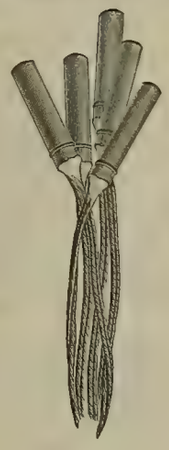
THE Chicago Pneumatic Tool Co. has closed its Norfolk office in the Chamberlains Bdg. and will in the future open an office in Richmond, Va. The office at 602 Empire Bdg. Pittsburg, Pa., will be closed April 1 and moved to 10 and 12 Wood street. The office has been closed at Seattle, Wash., and a new office opened at 84 Sixth street N., Portland, Oregon.

THE Santa Fe Railroad Co. has ordered 25 trucks built and equipped with patent axles, manufactured by the Railway Axle Manufacturing and Machine Co. of Los Angeles. These axles consist of a ball-bearing device whereby the turning of sharp curves is greatly facilitated. They permit of the wheels turning both in the same direction or in opposite directions or one wheel to turn faster than the other.

THE Cyclone Drill Company of Orrville, Ohio, has purchased the plants, equipment, business, patents, good will, etc., of the Cyclone Drilling Machine Co., and the Presler-Crawley Mfg. Co., and will continue the manufacture of the line of prospecting machines, water well, oil, gas and placer drills, blast-hole drills and economy loaders, double-cylinder gasoline engines, steam-engines and boilers, engineering devices, etc. The plant will be enlarged.

Trade Treatises.

The Cyclone Drilling Machine Co. of Orrville, Ohio, have issued a neat booklet descriptive of their drilling prospecting machinery, for boring for oil, gas and mineral, and for testing placer deposits. The various paraphernalia used for these purposes are illustrated and described.



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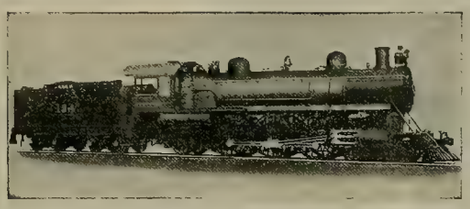

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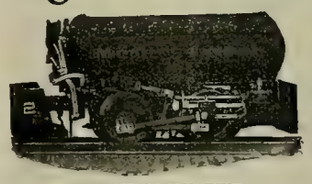

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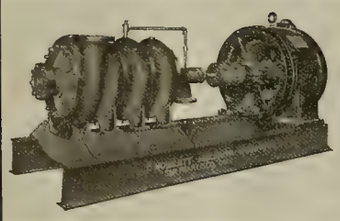

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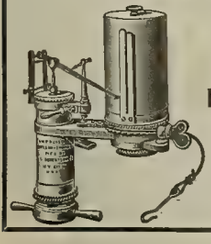

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SAN FRANCISCO, MARCH 31, 1906.

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EDITORIAL.

UNIFORMITY in reporting the output of mines and mining districts is desirable. In some cases the unit is a carload, in another a pound. Pounds are used for effect, a million of them seeming more than 500 tons. The term 'carload' is vague, for a carload may vary within wide limits; that of a narrow-gauge railroad may hold 10 tons and that of a broad gauge 20 tons or more. We would suggest that these unintelligent methods be discarded; let us agree to use the same unit—the ton of 2,000 pounds.

OUR FRIEND, the shift-boss, may fight shy of Professor Kemp's article on contact zones, because of his use of the graphic formula to express the chemical structure of certain complex minerals. But the matter is not so abstruse as it looks; it explains, better than much writing, how certain minerals are constituted and how they are related to other minerals found along the contact of eruptive rocks and limestones. The investigation of these zones and the determination of their origin, has been one of the most important results of applied geology; it has given many useful data for a correct understanding of an important type of ore deposit. For the needlessly technical kind of writing we have no liking, but this study of contacts made by Professor Kemp is that of a good friend to mining; he gives hints of immediate practical value.

THE Smelter Securities Corporation has not bought the Giroux Consolidated mines at Ely, Nevada, and the negotiations for merging the Boston Consolidated with the Utah Copper, broke down owing to a difference of opinion regarding the amount of ore reserves. In the meanwhile, the Guggenheims are extending their interests in Alaska, having arranged to acquire a consolidation of claims covering the valley of Bonanza creek, in the Klondike district, the intention being to dredge the bottom land and hydraulic the bench gravels. It is understood that $3,000,000 is involved, the scheme being to build a ditch 50 miles long, part of the distance being covered by pipe of four-foot diameter. The business was done through Mr. H. C. Treadgold, an appropriate name. It is interesting to add that Mr. Treadgold was formerly a don at Oxford, from which it is apparent that "the home of lost causes and forsaken beliefs" does not altogether smother the industrial initiative of the modern man.

THE MEASUREMENT of temperature at the bottom of the two deepest mines in Australia—both at Bendigo—indicates an increasing warmth, but less than that due to added depth; the difference being explained by the good effect of ventilation. The deep mines at Bendigo are close together, so as to be easily connected by levels. The Government Inspector of Mines found the temperature at the 3,856 ft. plat of the New Chum Railway mine to be 86° F., while at the bottom, at 4,069 ft., the thermometer registered 88°. The water at the west end of the shaft was 94° and at the east end 96°. In the Victoria Quartz mine, also on the New Chum reef, the temperature at the plat on the 3,824-ft. level was 76°, while in the shaft at 4,040 ft. it was 88°. The water was six degrees warmer. The New Chum Railway is warmer than the Victoria Quartz mine because it has an up-cast shaft, and receives air from an adjoining mine, while the Victoria Quartz receives fresh air through its down-cast shaft. As the mean annual temperature at Bendigo is 60° F., the increase at 4,000 ft. is not excessive.

ANDREW CARNEGIE is quoted as an advocate of the new spelling, and the daily press treats his views as having an important bearing on the matter. Mr. Carnegie's opinions on spelling have no more value than those of his coachman. Why is it that people regard the views of a rich man on every question as necessarily valuable? There is the young Rockefeller's bible class, for example; every Monday morning a large number of daily papers give a report of the vapid utterances offered by him to his class on the preceding Sunday, as if this insipid young man's twaddle was worthy of wide dissemination among intelligent people. It is mere toadying to wealth. This prostration before money debases the self-respect of the community. Mr. Carnegie holding forth on spelling and Mr. Rockefeller, Junior, commenting on the Bible, may be interesting to their immediate acquaintances, but for the press to give them space or for other more thoughtful people to take them seriously on these subjects, is simple snobbery. There are some subjects on which Messrs. Carnegie and Rockefeller could hold an audience breathless, namely, a detailed account of the manner in which they became so overwhelmingly rich; how they dodged the law, sandbagged their competitors, spoofed their associates and fooled the common crowd while they gathered the sheckels that now give them an aureate halo. As to the spelling question, the new scheme reminds one of the phonetic efforts for which small boys used to be flogged.

WE understand that the Mexican Gold & Silver Recovery Company has taken steps to collect royalty from the Guanajuato Reduction & Mines Company, and in the contest to be made by the latter it has been joined by other companies operating at Guanajuato. The agents of the corporation owning the cyanide patents paid an unexpected visit to the Bustos mill—described in our issue of January 13—and held court there under the authority of the local judge. This resulted in the placing of seals upon the doors and cyanide vats, closing down the mill. We trust the dispute will be settled amicably and out of court. Litigation over patent rights is of the most protracted and expensive character to all concerned. As a matter of history, it is amusing to recall the fact that the representatives of the cyanide company tested the application of their process to the silver ores of Guanajuato seven years ago and obtained discouraging results. Since then others have worked patiently at the problem, and now that they are successful they naturally resent the imposition of tribute. However, if the law decides that they are liable, they will doubtless acquiesce with the best grace possible, and in doing so make it more easy for the cyanide company to recognize the humor of the situation, and at the same time display the tactics of sound business by not exacting an unduly heavy royalty from people who have developed their own process after they themselves had failed in its application to the ores of this particular district.

A New Bureau of Geology.

The bill before Congress to establish a Department of Mines and Mining, to be presided over by a new cabinet officer, has been killed; on the other hand, a bill to create a Bureau of Geology and Mining in the Department of Commerce and Labor, has been presented by Mr. Franklin E. Brooks, of Colorado, and it has received a unanimously favorable report at the hands of the House Committee on Mines and Mining. The Bill proposes to transfer the Geological Survey, excepting the Reclamation Service, to the new bureau; of which the present director of the Survey becomes the official head. Inspectors of mines and their subordinates are also to be transferred to this department, which is to be authorized to "investigate, collect data with reference to, and publish and distribute information and reports concerning, the mineral resources and mining industries of the United States and dependent territory, etc." The director of the new bureau "shall have power to gather such data and information in regard to the operation of mines, labor and wage conditions, and in regard to mining machinery, methods, and appliances as will tend to the improvement, economy, and efficiency of mining methods and the safety of mining employees; and generally he shall have power to investigate and ascertain the facts concerning all questions of interest and benefit to such mining industries." All of which is comprehensive indeed. Fortunately, the Bill has been shelved; we hope it will remain in a quiet corner out of harm's way.

As it stands, this Bill is a concession to the popular demand for a mining department, but it is framed so as to increase the bureaucratic tendency of the existing Geological Survey, rather than to carry out the needs of the mining industry. It benefits the Survey in one way, by cutting off the Reclamation Service, which remains under the Interior Department; and it is logical in placing the Survey under the Department of Commerce, where it properly belongs. Beside assuming the duties of the Geological Survey, the new bureau undertakes those belonging to the inspection of mines for the Territories, the investigation of labor and wage conditions, as well as of mining machinery, methods, and appliances, with a view to other improvements, and, finally, the determination of the mineral or non-mineral character of

lands suspended from sale and entry by reason of dispute as to their classification. This last duty the Survey already attends to, when called upon by the Secretary of the Interior. The government inspection of mines is likely to be a dead letter, inasmuch as the Bureau could not act in the States. The investigation of mining machinery, etc., is a dangerous thing for the Survey to undertake; the officers of it are by no means adapted for such work and they will come into conflict with private interests, to antagonize which will be only less harmful to the good of the Survey than to humor them.

Most of our readers take an interest in the useful work of the Geological Survey and to them this accession of bureaucratic powers will seem like a step further in a wrong direction. As an organization of scientific men, the Survey commands the sincere respect of the mining public, as a statistical, industrial and political bureau, it is held in no particular regard. The mining people have expressed a desire for a Mines Department at Washington, it is an impertinence to offer this hybrid bureau in fulfillment of that desire. The Survey should be under the control of a Mines Department; but this is not to be done by tacking a mining bureau onto the existing heterogenous affair of which Mr. Walcott is the distinguished chief. For the geological people to meddle with mine inspection, the examination of machinery or the investigation of metallurgical processes is only to copy existing blunders of administration, as, for instance, the stupid arrangement by which officers of the army are given charge of irrigation problems, for which they have had no training whatever. It all makes for confusion, for inefficient work and, worst of all, for a great deal of jobbery at Washington. Give us the old Geological Survey, shorn of its wood and water excrescences, free from wire-pulling and lobbying; restore it as a corps of enthusiastic scientific men, such as the band of geologists under Clarence King, who made the Survey famous in Europe and tremendously useful in America.

The Impending Coal Strike.

On March 31 the agreement based upon the awards of the Anthracite Strike Commission of 1903 expires, and on April 1, unless an amicable arrangement is concluded, there will be a general coal strike, not in the anthracite districts alone, but also in those that produce soft coal. On January 27 there met at Indianapolis a joint conference of operators and miners representing the bituminous coal-mining industry of Pennsylvania, Ohio, Indiana, and Illinois —constituting the so-called competitive district—and it was decided by an amendment proposed by John Mitchell that all the coal-mining districts "under the jurisdiction of the United Mine Workers of America, whether anthracite, bituminous or block-coal regions, in the United States and Canada" should stand or fall together in their demands for higher wages and other betterments. The miners rejected the proposition of the operators to continue work at the old scale and demanded a 12½ per cent increase; since then, after several conferences, the last of which took place this week, this has been brought down to an irreducible minimum of 5.55 per cent, being equivalent to the restoration of the wage scale of 1903.

Such is the situation in the bituminous regions; meanwhile, the approaching end of the agreement between the operators and miners in the anthracite region of Pennsylvania has led to exchange of views. On February 27 the demands of the mine workers, as represented by a committee, of which John Mitchell is chairman, were forwarded to George F. Baer, the chairman of the operator's committee. These demands included the establishment of an eight-hour day, a readjustment of wages said to be equivalent to a 10 per cent increase, the formation of new boards of conciliation, the recognition of the United Mine Workers and the collection by the companies of the monthly dues payable by the miners to that labor organization. In advocacy of his side, Mitchell urged that the uniform scale of wages was desirable because "men performing precisely the same character, and indeed the same amount of labor, cannot work with any degree of contentment while the compensation received by them is not uniform." The increase of 10 per cent in the rates paid to contract miners was asked on the grounds that the general industrial and commercial conditions of the country "justify an increase of wages to all classes of labor" and, as a further argument, attention was directed to the unprecedented prosperity of the coal railroads as demonstrated by their earnings and by the enhanced value of their stock quotations. As to the eight hours, this was claimed to be the standard work-day obtaining in nearly all the bituminous regions; it was as long as a man can work in a coal mine without injury to himself, and it would not reduce production materially.

In reply, the committee of the operators stated that they stood unalterably for the open shop and declined to recognize the United Mine Workers of America, "an organization controlled by a rival industry," meaning bituminous coal. As to eight hours, they claimed that the loss of time would curtail production and compel expensive machinery to remain idle one hour longer. Uniformity of wages was held to be impracticable by reason of the varying capacity of workmen and the varying conditions under which they labor. In regard to the request that the operators collect from each employee the fixed sum needed for the support of the union, the committee said that they "would not make such an agreement, and as a matter of law they were not permitted to make it." Finally, they fell back upon the findings of the Anthracite Strike Commission and offered to continue the old agreement—based upon the decisions of that Commission—for another term of three years.

So the matter stands at this time of writing. The trouble in the bituminous regions would be readily adjusted save for the attitude of Mitchell and his friends who emphasize their power by involving the anthracite region in a general strike unless the demands of both the anthracite and the bituminous miners are conceded. By the Indianapolis resolution there was given to Mitchell the power to settle labor troubles in mining regions far apart, producing different kinds of coal, working under dissimilar conditions and tributary to antagonistic markets. Here is one of the dangerous elements in the situation. By his evidence before the Strike Commission and by his speeches on labor troubles, Mitchell has shown himself, in our opinion, to be an insincere man, a labor delegate of unusual cheek and a scheming official representing a tyrannical labor organization, the interests of which are not always those of the laborers whom it dominates. On the other hand, the coal operators are represented by five presidents of coal companies, headed by George F. Baer, a man ridiculous in his vanity of power, a narrow-minded egoist who is quite incapable of seeing that working men, just as much as 'coal barons' are deserving of just treatment; in fact, this term 'coal barons,' while it may seem the humorous exaggeration of newspaper scribes careless of words, is indeed a fitting description of the group of men whom the great coal industry has placed in a position of power for which they, just like Mitchell, are unfitted by temperament and training.

The public will resent a general strike; it means the cessation of work over a wide territory, the disorganization of business and severe loss to individuals as well as corporations. During the great strike of 1902 the mine workers lost about $25,000,000 in wages and the coal production fell off 24,600,000 tons; the receipts of the coal companies were reduced $46,100,000 and those of the affiliated railroads $28,000,000, making a total loss, to the parties concerned, of $123,700,000. But this omits the injury to the public, the suffering to the poor who could not buy coal during the winter of 1902 and the crippling of industrial operations all over the country. The losses of the two parties to the strike were made good, for the mine workers got an increase of wages and the operators made tremendous sales of coal as soon as the strike ended; the increase of 50 cents for anthracite put on at the time of the strike gave from 45 to 50 million dollars per annum extra to be divided among the miners and the operators. Who paid the difference? The public. And now they propose to fight again like cat and dog, with the sure result that the consumer will pay for it; for, in the end, whatever increase of wages be paid to the coal miners, the operators will advance the price of their coal, with a little extra on the side. There is no valid reason for a strike; the questions at issue should be submitted to a board of arbitration.

By the Way.

In the current issue of the *Sunset Magazine* there is an interesting article by Mr. Charles G. Yale, formerly, and for twenty-two years, the editor of the MINING AND SCIENTIFIC PRESS. Mr. Yale says:

The man who invented the advertising phrase about California being the land of "sunshine, fruit and flowers" must have been a newcomer, because he omitted the very thing of all which made California famous throughout the world. The Golden State it has been, and is today. It was the gold mines which brought men here to settle it, and the gold mines which kept it on its feet until other resources might be developed. There are sunshine, fruit and flowers in many regions and many States, but gold deposits of note in but few. When one recalls the fact that California has yielded 52.44% of the total gold output of the entire United States since 1792, or close on to a billion and a half of dollars, it seems odd that so startling a fact should be ignored in a phrase intended to advertise the State. With 22 States producing gold, this one has produced one-half of all that has come out of American ground in over a century, the combined product of all the others not being able to reach it. For 57 consecutive years the average annual output of gold in California has been $25,250,000. And yet, after all these years, there are more producing gold mines in California today than any other State in the Union; the total number being, quartz and gravel, 1,185; Colorado coming next with 588. Gold is still being mined in these modern days in 34 counties of the State.

As a gold-producing region California has, among other mining States in the Union, the distinction of holding the record in all particulars. It has made, largest output in any single year; made the by far, the largest aggregate product; made the highest annual average though its mines have been worked over half a century; kept the lead as a gold-producer the greatest number of consecutive years; pursues the largest number of varied branches of gold mining; and has the widest geographical distribution of all its gold deposits.

In giving some brief consideration to the present condition of the mining industry in California, as compared with its past, it may be said that the pioneers were all placer miners, and the pick, shovel, pan, rocker, sluice and long-tom comprised their appliances; the gulches, ravines, river-beds and bars the source of their gold. No capital was required, and no extensive companies needed. Little or no development work had to be done, as the claim paid, or did not, after brief work. Those were the days of individual miners, or unorganized companies of partners. Yet, even under these simple conditions they took out from $10,000,000 to $80,000,000 per year in the first four years. The deep gravels in the now famous ancient river-bed channels were unknown, and quartz was little thought of. Gradually, however, as might have been expected, the available area of this kind of mining was narrowed, as the ground was worked out, and attention had to be turned to other sources of gold supply. This led to the discovery of the ancient channels, buried beneath the lava-capped divides, subsequently worked by drift mining; and those with no lava capping by the hydraulic process, the cheapest operated of all forms of gold mining, and having its origin in California. Attention, too, was turned to quartz as the original of all this surface gold.

With the exhaustion of the open surface gold deposits, the day of the individual miner practically came to an end in California. Then both the character of the mining and the mining population changed. It was no longer possible for the nomadic miner, with a few simple tools, to gather a fortune in a few days from a deposit which nature had concentrated for him in a few yards of earth or gravel. It became necessary to employ both capital and labor to carry on gold mining under the changed conditions. Ditches and reservoirs had to be built for water supply for hydraulic mines; long tunnels run to tap the buried channels under the divides; and shafts had to be sunk, and mills, pumps, hoists and other machinery provided before profit could be made from the quartz mines.

Thus it was that the great body of the miners stopped working on their own account, and were employed for daily wages by the companies which were organized to conduct the operations requiring investment. The miners gave up their nomadic instincts, became permanent residents of the camps or mining towns, taking steady employment in mines and mills, and this condition continues today. Of course, there are still many prospectors throughout the mining regions, as well as miners who work their own 'prospects,' but the majority of the mining population is now engaged in work for the companies. This has resulted in the building up of thriving, permanent towns in all the centers of mining.

The era of speculative mining incidental to newly settled mining regions has long since passed by in California, and the business is, in these days, conducted in as legitimate a manner as farming, manufacturing, etc., profits being sought from the product in the mines themselves, and not from fictitious and evanescent 'stock' values.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

THE grade of mill plates varies, but about 1¼ in. per foot is a fair average fall.

NATIVE SULPHUR occasionally occurs in gold veins as the result of oxidation of pyrite.

A FEW OPALS of inferior quality have been found in California, notably at Mokelumne Hill.

NUMBER 3 shaft of the Tamarack copper mine, near Houghton, Mich., is now the deepest vertical shaft in the world—5,128 feet.

ONE miner's inch under four-inch head (four inches from center of the orifice to surface of water) will flow close to 13,000 gal. water in 24 hours.

LOW-GRADE copper ores may be smelted if the necessary fluxes and fuel are at hand, and the process is not too expensive to admit of a profit on the operation.

SOME pyrite, particularly amorphous varieties, are hygroscopic, and when brought into a moist atmosphere deliquesce, crumbling into a shapeless, earthy mass.

INFORMATION concerning all the reports of the United States Geological Survey can be obtained by addressing the director of the Survey at Washington, District of Columbia.

THERE is little doubt but that a fault cutting a vein in many instances has had the effect of enriching it. There are numerous occurrences known to 'Concentrates' where this is the fact.

OBSIDIAN is probably more often mistaken for a valuable mineral than almost any other. Among the things for which it is sometimes mistaken by the uninitiated are anthracite coal and pitchblende.

RAISING in a mine is generally less expensive than sinking. Where a long connection is to be made between two levels it is good practice to raise from one level and sink at the same time from that above.

MINERS generally use either common yellow soap or axle grease to 'dope' primers before placing them in wet holes. Either of these serve the purpose well if properly arranged and tied tightly with a piece of twine.

WHEN zinc and copper are placed in contact voltaic action is set up, particularly if moisture be present, resulting in the destruction of the zinc. Salt and lime, and water containing lime in solution, is also detrimental to zinc.

WHERE a narrow strip of slaty or schistose rock is found at the side of a vein in granite, this schist is probably due to the shearing of the granite. Slates in contact with granitic intrusions often develop metamorphic crystals, such as chiastolite.

THE increase in temperature with depth in the mines of the Rand has been determined to be one degree for each 208 ft. of increase in depth. At 1,000 ft. depth the normal temperature is 68.75° F., at 4,000 ft. 83.15°, at 6,000 ft. 92.75°, and at 8,000 ft. (estimated) 102.35°.

THE enrichment of mineral vein and ore deposits by chemical processes which take place near the surface is now generally recognized, and the conservative miner does not feel safe passing judgment on a mineral vein until he has satisfied himself that normal conditions have been reached.

THE most satisfactory method of treating silver-lead-zinc ores is by crushing the ores, separating the zinc from the other sulphides by electro-magnetic separators or otherwise and sending the products to the smelter. This is being done at a number of places in Colorado.

THE separation of lead and zinc sulphides in complex ores is in successful operation at Leadville and other places in Colorado; in British Columbia, and in many other districts. The essential conditions for success are ore rich enough to pay the expense (which must necessarily vary in different places), a good machine and an operator who understands the process.

THE treatment of silver-lead ore containing zinc is attracting much attention at this time, especially at Broken Hill, in Australia, where the problem is to separate an intimate mixture of blende and galena. Several ore flotation processes, such as those of Potter and Delprat, have been used successfully in large-scale tests, and now the Elmore oil process has been modified for the same purpose. Furthermore, the zinc corporation has another promising method in which an air-jet serves to induce the flotation of the sulphides. The principles underlying these ore flotation processes were discussed at length in the MINING AND SCIENTIFIC PRESS of February 24, 1906.

FOR some time past a suit has been pending in the Colorado courts to quiet title to mineral lands under the streets and alleys of the city of Leadville. The Supreme Court of the State is expected on April 1 to render a decision in this matter, which will determine whether the mineral rights belong to the city or to the respective mines. The lower court decided for the mining companies and the city appealed to the Supreme Court.

OLD-FASHIONED mining plants are being sold to mill founders as 'old iron,' and are going into the iron furnaces, and recast in the form of modern machinery of better type, higher efficiency and in every way superior to the old. Hundreds of thousands of dollars worth of old machinery on the Comstock has thus been converted into machines of late design. The old plants were good in their days, but the modern type is better suited to the work to be performed, and is cheaper than the old was in its day.

ORES, containing arsenic and sulphur, when heated, give off fumes of these elements. Arsenical ores give out an odor like garlic when heated, and the smell of sulphur is familiar to all. When mispickel is heated before the blowpipe on charcoal, it yields an abundant, white coating and dense, white fumes, and the mineral becomes magnetic. After a short treatment the residue on the charcoal becomes soluble in hydrochloric acid, with evolution of sulphureted hydrogen (smelling like rotten eggs) and the precipitation of the yellow sulphide of arsenic.

WHERE a vein from 18 in. to 8 ft., with from 6 to 18 in. of low-grade material on one side, occurs, it may be possible by careful mining to stope out the poor ore first, allowing the good ore to stand, removing the latter separately, to avoid mixing the poor with the rich. If one side be softer than the other, this soft ore should be stoped first, whether it be the rich or the poor side, for if the hard ore be first stoped it will be almost impossible to keep out a great deal of the soft rock. The stope may be timbered, if timber be necessary, in the same manner as any other workings of similar width between walls.

TO CONVERT a machine-drill into a trip-hammer, simply upset a piece of drill-steel, forming a proper head thereon, and place this in the chuck in the same manner that you would the drill, tightening the bolts. The machine, of course, should be properly secured by means of strong 'U' bolts to a suitable timber frame, so constructed that the anvil may be placed in position underneath the drill. When all is ready turn on the air, the same as though you were going to drill a hole in the rock. The intensity and speed of the blows is regulated by the amount of air turned in, or by the pressure, which may be controlled. No special valve-gear or any change in the machine is necessary.

MICA occurs in dikes of coarse granite. These dikes are mined in the same manner as veins, the rock being sorted either underground or on the surface, or both. The mica is found in groups of crystals, called 'books,' owing to the cleavage of mica plates which resembles the leaves of a book. These 'books' are split up, the good mica sorted out and cut by machine into as large sizes as the shape of the sheet will admit. These sheets are bound together in packages and shipped to stove manufacturers, and elsewhere. The waste is either cut into small discs and strips for insulation of electric lamps and wires, or is ground and sold for lubrication, the manufacture of wall paper and for many other purposes.

THE fossil remains of a dinosaur were discovered in the Bad Lands of Wyoming in 1899. The ribs of this gigantic extinct animal were 9 ft. long; his tail 60 ft.; his neck 30 ft., and it was calculated that his abdominal cavity, with lungs and entrails removed, would have formed a room 34 ft. in length, 16 ft. in width, with a probable height of 12 ft., a space in which 40 people might find seats. A round steak cut from the ham of this beast would have been 12 ft. in diameter, with a solid bone in the center 12 by 14 in., with no hole for marrow. The animal was 130 ft. long, 35 ft. high at the hips and 25 ft. high at the shoulders, and weighed about 130,000 lb. The skeleton of this gigantic mammal was set up at the University of Wyoming.

ORE is occasionally lost by the settling of large masses on the timbers of the first few sets, near the bottom of a large stope, the tremendous weight of the great mass of ore slowly crushing the timbers and forcing them out of line, causing them to jack-knife, and if filling is not at once resorted to, complete collapse is likely to follow. In one instance where this occurred—as a result of stoping out too large a superficial area—the stope was practically lost, but filling was run in as fast as possible, and the stope abandoned temporarily. A drift was then run in the foot-wall 60 ft. from the vein and in it at distances of 60 ft. square sets were placed and inclined raises started toward the orebody. These were carried into the ore above the cave and the ore removed through them, with very little loss.

SHAFT REPAIRING generally proceeds from the top downward. The work may usually be facilitated by the construction of a chute of two-inch plank, built in short sections, and extending in the shaft from a level to the next above. All pieces of old lagging, waste blocking and rocks can be shoveled into the chute, through which it falls or slides to the level below, where it can be directed into an ore-pocket and from there run into a skip and hoisted into the surface, the chute sections being removed as the repairs progress downward, set after set. If the shaft is to be enlarged, it is best to cut out the additional ground from below, working upward, if the shaft timbers are in good condition. If not, the benching out of the new compartment should be carried on from the top downward, and the shaft retimbered at the same time.

THE strongest form in which a hollow glass vessel can be blown or moulded is the perfect sphere, which is much stronger than a bottle of any shape, of the same thickness and quality of glass. The United States steamer *Albatross*, in the service of the United States Fish Commission, has among the numerous interesting exhibits to be seen in that vessel many hollow spheres of thick glass, which have been submerged in a net to a great depth—15,000 ft. or more—by means of heavy weights attached. These were sunk containing nothing but somewhat rarefied air. Some of them are completely filled with sea water forced in through the pores of the glass; others are partially filled, and some of them broke under the tremendous pressure—over 6,600 lb. per sq. in. Beside these glass globes are specimens of fish caught at the same great depth. Accurate soundings have been made over 3,000 fathoms, or about 18,000 feet.

WHETHER or not a junior apex proprietor could retain possession of his vein after it had united in depth with the vein of another (senior locator), even though the two veins were easily distinguishable, one from the other, and separated by a distinct seam of clay or gouge, has not been determined by the supreme court. Nor has the amount of displacement of a vein by a fault, which is permissible in the identification of a vein so faulted, been fixed by law or the courts. There would probably be no dispute in the event of a displacement of 20 to 50 ft., if the conditions were such as to make the identity of the faulted vein certain, but if the throw were 300 ft. or more, it is uncertain how the courts would view the proposition. In some instances the amount of displacement increases along the line of faulting—starting at nothing it may reach many hundred feet in half a mile. Just where the line would be drawn in determining the identity of such a faulted vein is as yet undetermined.

IN the square-set system of timbering the framing is usually suited to the direction of pressure of the superincumbent mass as demonstrated by experience in each mine. Where there is a heavy downward pressure, such as is often observed where the orebody stands nearly vertical, the timbers are so framed that the posts meet when placed in the set. In veins inclined flatter than 65%, where heavy pressure is evident in the hanging wall side, the caps may be so framed that their adjacent ends butt one on the other. In such cases it was formerly the practice to put in angle braces to aid in sustaining this side and downward thrust. To make this most effective the height and width of the set must be so adjusted that the direction of the angle braces will be at a somewhat higher angle than a line normal to the direction of the pressure, which will assist the timber frame in supporting the weight, in this respect acting in the same manner as stulls. A better arrangement than the angle braces is the filling of the stopes contemporaneously with the extraction of ore, which practice renders the angle braces unnecessary, and usually timbers of smaller dimensions may be used, thus further reducing the expense, while ensuring safety and the complete removal of all the ore.

THE oil engines now in use are designed with their valve mechanism arranged to work either on the Bean de Rochas cycle, or on the two-cycle system. These two types are variously designated, the former being usually known as the Otto cycle, the four-cycle, and occasionally (erroneously) the two-cycle. The other is called the two-cycle, or sometimes single-cycle, the first designation being correct. With those engines working on the four-cycle the succession of operations is as follows: 1. Drawing in the air and fuel during the first outward stroke of the piston at atmospheric pressure. 2. Compression of the mixture during the first return stroke of the piston. 3. Ignition of the charge and expansion in the cylinder during the second outward stroke of the piston. 4. Exhausting the products of combustion being expelled during the second return stroke of the piston. This is the four-cycle engine. In the two-cycle engine the entire series of operations is completed in a single revolution—that is, the passage of the piston from one end of the cylinder to the other and back again. In this type, during the first part of the outward stroke of the piston—that is, until the piston uncovers the exhaust port—expansion is taking place. When the exhaust port is opened the products of combustion are expelled; the piston then moves a little farther forward and uncovers the air-inlet port communicating with the crank chamber. The air at slight pressure rushes into the cylinder, aiding in the expulsion of the burnt gases, and filling the chamber with air already compressed to five or six pounds per square inch, in the crank chamber, completing the first stroke of this cycle. The next stroke (being the inward stroke of the piston) the fresh supply of air and gas is first taken in, when compression of the charge follows and ignition takes place when the piston reaches the back end. These two strokes of the piston, or one revolution of the crank shaft, complete the cycle of operations.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—Mr. Burrows' discussion in regard to the shape of a proposed 2,300-ft. shaft at Guanajuato is most interesting, but his conclusions, considering the purpose and probable future of his shaft and in view of the practice in the Pennsylvania anthracite coal region, seem to me hardly warranted, for what appears to be a special case, influenced as it was by the expectation of enlargement and by the existence of the old Mexican shaft.

The practice in this region is to hoist a mine-car of coal on a single-deck cage; the cars are usually 10 ft. long and 5 to 6 ft. wide over all, and weigh loaded from 8,000 to 10,000 lb.; this has required a hoisting compartment 8 by 12 to 8 by 13 ft., measuring width to the centers of the buntons, and practically all the anthracite shafts are sunk in multiples of this size, rarely smaller than 12 by 16 ft., and as large as 13 by 48 ft. inside the timbers.

Among the deep shafts are the two Auchincloss shafts, Delaware, Lackawanna & Western R. R. Co., two and three compartments, 1,610 ft. deep; Bear Valley No. 2, Pennsylvania Railroad, six compartments, 1,650 ft. deep; Lytle, Pennsylvania Railroad, five compartments, 1,550 ft. deep; two South Wilkes-Barre shafts, Lehigh & Wilkes-Barre Coal Company, two and three compartments, 1,200 ft. deep; Susquehanna Coal Company No. 1, five compartments, 1,000 ft. deep, etc.; these and many others sunk in the strata of the soft-coal measures prove conclusively that there is no insurmountable difficulty in sinking and maintaining shafts of very large size even in soft rock.

To take up Mr. Burrows' points in order:

First. Cost of Sinking.—The cubic contents of the two proposed shafts in their neat dimensions are as 4 to 5, making apparently 25% more material to be handled in the 10 by 10-ft. shaft; this, it seems to me, is largely an apparent advantage; it is impracticable to sink to the neat lines proposed, and, as far as my experience goes, the excavation will in every case be larger than the proposed neat section, and as the perimeters of the proposed shafts are as 20 to 21 in favor of the 10 by 10-ft., any material removed in excess of the neat section would tend to decrease the apparent difference in quantity, which, in my judgment, would in practice be probably nearer 15 per cent than 25 per cent.

Second and Third.—There is no question in my mind that fewer and deeper holes could be used with less shattering of the sides in the 10 by 10 than in the 5 by 16-ft. shaft. The huge Bear Valley No. 2 shaft, 16 by 54 ft., neat excavation, the largest and deepest in this region, was sunk 1,650 ft. largely through exceptionally hard white conglomerate rock with six rows of parallel holes, the center-cut holes being eight feet and the four outside rows nine feet deep; the shaft was not shattered and required but little blocking in squaring up; the usual charge in these holes was six sticks of 60% gelatine. Such holes and charges would be utterly impracticable in a 5 by 16-ft. shaft, which, unless the sides are to be much shattered (with resulting additional mucking), would necessarily be sunk with much shorter holes and with comparatively light charges.

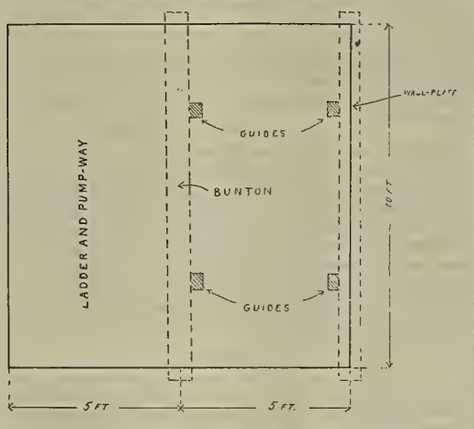
Fourth.—The 10 by 10-shaft will not merely give the larger pump and ladder-way, as suggested by Mr. Burrows, but it gives an immediate possibility of using the shaft for two hoist-ways, one, if necessary, for hoisting water; and with the depth proposed it is more than probable that it will be found advantageous to hoist water from the bottom instead of pumping 2,300 ft. vertically. Further, the 5 by 10-compartment presents possibilities for some mechanical ventilation during sinking without entailing the waste of power involved in using high-pressure air in small pipes for this purpose.

Fifth.—The proposed enlargement of the 10 by 10-shaft can be made from the ladder-way compartment without material interference with the regular hoisting, by simply installing hoisting machinery over this compartment; this is impracticable with the 5 by 16-shaft with a jog at 320 ft., as designed by Mr. Burrows, and hardly feasible even should the shaft be opened 5 by 16 ft. to the surface. The jog in any event is most objectionable and the necessary bends in the pipes in getting from the pump-way at the end into the space left at the side of the old shaft will be a perpetual source of annoyance, beside materially adding to the friction in the pump columns.

As to the timbering, your sketch of the 10 by 10-shaft shows the two hoisting-compartments separated by buntons; this is unnecessary and has long been abandoned in water-hoist compartments here; all that is necessary for the hoisting-compartments is one wall-plate and one bunton, as shown.

With this arrangement the 10 by 10-shaft requires two sticks, each 11 to 12 ft. long, and the 5 by 16 three sticks, each 6 to 7 ft. long, to support the guides, or practically the same length of timber in each shaft for the purpose. In this I am assuming that the sides will stand without timber support, as Mr. Burrows states is the case in the old Mexican shaft which it was proposed to extend. The No. 1 shaft of the Susquehanna Coal Company and many others here have stood for over a quarter of a century without timber other than above outlined.

I cannot agree to the proposition that "there is no way to take advantage of the mucking in shafts of larger section because the buckets can only be hoisted as fast as the machinery will run, etc."; there



is nothing in the 10 by 10 plan of shaft to prevent using two hoists for sinking as is done in all the large shafts in this region, and by putting in permanent wooden or iron guides during the sinking such speed of hoist can be safely attained as will make the hoisting capacity more than equal to the loading.

The reference to precedent in the latter part of Mr. Burrows' discussion seems to be in his mind the

The Shaft Under Discussion. Nueva Luz, Guanajuato.

crux of the matter, and as my practice has all been in the direction of large shafts, I may perhaps be excused for not giving it so much weight.

The greatest advantage to my mind in the 5 by 16-ft. shaft has not been touched upon. It is in a probably more advantageous arrangement of the foot, made possible by the location of the compartments, which permit approach on both sides, while in the 10 by 10-shaft one side is occupied, and all loading of skips or cages must be done from one side only.

R. V. NORRIS.

Wilkes-Barre, Pa., March 7, 1906.

THE ROYAL SCHOOL OF MINES, LONDON.

The Editor:

Sir—The recent gloomy editorial referring to the Royal School of Mines seems rather pessimistic to those interested in its welfare.

It is only too true that the past justifies such a view of the matter, though there is also a brighter side for the optimist. The vital question seems to be whether the welfare of mining education will be considered of paramount importance throughout the course under the new regime. It is generally recognized that the training of an engineer must be founded on a sound elementary education, followed by a general scientific course, without any technical details or early specialization, a fact which suggests the question of the proper connection of technical training with the strictly academic courses of the universities or scientific colleges. The latter should be the training ground for men of the mining school and entirely in sympathy with it. Technical training is not identical with a scientific education, but rather the study of the application of Science to the Arts, and hence the necessity of a preliminary scientific training is self-evident.

At the Royal School of Mines, courses in mine-surveying and metallurgy, probably unrivaled, suffer from the variable ability and sincerity of the students forming the classes, due to the low standard required for entrance, and the fact that much of the preliminary training is in a school which is essentially a training college for teachers. Association of a school of mines with other really good engineering colleges cannot be anything but beneficial, but the relationship of the universities and scientific colleges of Great Britain should be that of mines supplying the raw but valuable material to the smelter to be shipped as base bullion to the refinery of engineering practice.

D. F. C.

Keswick, California, March 18, 1906.

BLAST FURNACE *vs.* REVERBERATORY.

The Editor:

Sir—Acknowledging your request for answers to the twelve questions brought forward by James W. Neill, in your issue of March 3, I shall give my replies as briefly as possible:

(No. 1) *On what should the choice of furnace type be principally based? Character of the ore, fuel, fluxes, building materials?*

Character of ore: that is, where the mine product is *all* in the nature of concentrate; it is advisable to roast automatically and then smelt in a reverberatory furnace, on account of the fineness of the product.

The percentage of fuel consumed by this method of smelting is much greater than smelting in a blast furnace; a cheaper fuel can be used, less flue-dust is made to be re-smelted and the cost of briquetting is avoided. I emphasize the word "all" before concentrate, because the advantages of smelting in a blast furnace without roasting are so obvious; one quickly realizes the fact that they will offset the cost of briquetting a great proportion of the burden to be smelted. Eight men and one machine will average 50 tons per day (10 hours) of briquettes (the manufacturers claim 80 tons). I do not consider the cost of burnt lime as a bonding material as anything, as lime is always necessary and burnt lime has its advantages, as explained by me in the *Engineering and Mining Journal*, February 21, 1893, as follows:

"We have been using burnt lime nearly altogether for over eight years, and find that it has the following advantages: It requires no crushing or sledging and can be hauled direct from the car to the charge scale. (2.) The furnaces keep open better, make clean slags and less accretions form on the sides of the furnace. (3.) More ore can be smelted with the same labor and fuel than can be smelted with lime-rock at less cost—e. g., we will suppose a 1,000-lb. charge is to be used, and we require 150 lb. CaO, net, and we are using lime-rock analyzing CaO, 53.86, SiO_2 1% net CaO would be 52% and the charge would be 712 lb. ore and 288 lb. rock. Now if we were going to use the same lime burnt it would have the following analysis: CaO 96.72; SiO_2, 2%, and the net CaO would be 93%. A 1,000-lb. charge would be as follows: 839 lb. ore, 161 lb. burnt lime, showing that 127 lb. more ore can be smelted in each charge with lime burnt than when not burnt, and the same labor and fuel at the furnace and no crushing outside. Any one knowing how many charges his furnace has made can multiply the number by 127 lb. of ore and that by the treatment charges they receive for smelting and find out how much more he has saved to pay the difference between the cost of lime-rock and burnt lime."

In regard to fluxes: if the same care, as a rule, were practiced when making up a reverberatory charge that is used with a blast furnace, perhaps the slag would be as clean, so I consider the flux question a neutral one.

A reverberatory furnace has an advantage over a blast furnace in regard to the character of the fuel, as cheap coal or wood can be used to advantage; but one must consider the enormous amount of fuel required in a reverberatory furnace. See Lewis T. Wright's article on 'Pyrite Smelting Without Coke,' in your issue of February 24th, 1906, where he states the amount of fuel consumed in the repeated operations of the old-style reverberatory furnace as compared with their work at Keswick, where they run their large blast furnaces with little, and at times no coke, making a fair concentration without preliminary roasting. Even in a most modern reverberatory smelting furnace, described by Professor L. S. Austin, in your issue of March 3, 1906, built at the Washoe plant, Anaconda, 102 to 117 ft. long by 19 ft. wide, having a daily capacity of 275 tons, the coal consumption is 21%, which reduces the cost down to $1 per ton of charge; the dollar per ton of charge will fully cover the cost of smelting in a large blast

furnace direct, without preliminary roasting. Of course the cost of preliminary roasting in the improved McDougall calciner, as practiced at Anaconda, Montana, adds very little to the above cost.

The cost of smelting in a blast furnace was given by Wm. A. Heywood, in his contribution to the work on 'Pyrite Smelting,' at $1.05 per ton. This cost of smelting has been still further reduced by the smelting practice at the Granby smelter, near Phœnix, British Columbia.

This does not necessarily imply hot blast in all cases, as some of these low figures have been obtained by the use of a small percentage of coke with cold blast. It is my judgment that a small percentage of coke is advisable in all cases to prevent too frequent freeze-ups. An increased tonnage of ore can be smelted with a smaller percentage of coke with the use of the hot blast.

In isolated localities, where sulphide ore exists and coke is too expensive, by the use of hot blast and the addition of green wood, cut in short blocks, (oak preferred), smelting can be carried on in blast furnaces without the aid of coke, judging from my experience on one or two occasions while in New Mexico, where we tried both lignite, coal and wood. The coal is too soft because of fine made by decrepitation, igniting too near the top of the furnace, but short blocks of green wood (pine was all that we could obtain) gave excellent results, and at this time our blast was not heated to more than 200 to 250° F.

Again, the question of arsenic is a serious one, especially if the company has to market the matte, as arsenic is usually penalized at 50c. or more per unit in excess of one per cent, and arsenic is much easier volatilized in a blast furnace than in the reverberatory, as fully explained in my contribution to *Transactions* of the American Institute of Mining Engineers, Vol. XXXIV, page 422.

(No. 2) *What are the comparative costs per ton of daily capacity of each type of furnace? In the case of the reverberatory, this cost should include the cost of the necessary roasting plant.*

This is fairly covered by the answer to question 1, except to state, smelting direct in a blast furnace without preliminary roasting avoids the erection of a reverberatory roasting furnace, costing anywhere from $18,000 to $25,000, having a daily capacity of from 30 to 40 tons, and the necessary crushing and rolling machinery to prepare the ore for a reverberatory roaster, unless the mine product is already in the form of a concentrate.

(No. 3) *What is the comparative space required for an equal tonnage?*

It is self-evident, without giving exact figures, that the blast furnace has the best of the argument. In comparing the largest reverberatory smelting furnaces and blast furnaces in operation, as described by Professor L. S. Austin in your issue of March 3, where he states that a reverberatory furnace 19 ft. wide, 117 ft. long, has a daily capacity of 275 tons; a blast furnace 56 in. wide by 51 ft. long has a daily capacity of 1,600 to 1,850 tons.

(No. 4) *What is the comparative cost of mechanical equipment for equal tonnage?*

This had best be answered by the mechanical engineer.

(No. 5) *What are the comparative costs of power, labor, fuel, and repairs?*

This has been practically answered in a general way by my reply to question 1, except in regard to repairs. My experience with properly water-jacketed blast furnaces has been that with the exception of the fire-brick in lining the overflow spouts, a blast furnace will go for months requiring very little repairs. There is considerable destruction of steel, but it is small in proportion to the destruction of iron in the machinery and tools used about either an ordinary hand reverberatory roaster or the latest improved mechanical roasting furnace. The fire-box linings, bridge-walls and arches over the fuse-boxes in the reverberatory furnace, which have to be built of expensive fire-brick, are constantly burning out.

(No. 6) *What are the comparative amounts of capital tied up in furnaces of each type, and how does this affect the cost per ton of daily capacity or of output?*

A reverberatory plant would cost approximately five times as much as a blast furnace of the same capacity, and of course interest on capital invested should always be considered, and reverts back to the cost of smelting per ton of ore.

(No. 7) *What are the limiting necessities in the way of fuels for each type?*

This has been sufficiently answered by replies to No. 1.

(No. 8) *What are the comparative losses in slag, dust or middle products?*

All reverberatory furnaces have some little advantage over the blast furnaces when it comes to the amount of flue-dust made, but this is much more than offset by the greater value lost in the slag. From slag samples, which I have had taken from reverberatory smelters, and slag taken from blast-furnace smelters, I have found that blast-furnace slag, as a rule, is the cleanest, but I do not care to state the names of the different smelters where the slag was obtained.

My statement is borne out by referring to James W. Neill's article, 'Blast Furnace *vs.* Reverberatory,' which appeared in your issue of March 3, which shows (in 1904) 0.23 oz. silver and 0.4% copper in favor of the blast furnace, and, in 1905, nearly 0 24 oz. silver and 0 28% copper in favor of blast furnace, which at the present prices of silver and copper is considerable; copper at 18c. per lb. equals $3.60 per unit; 0.4% shows $1.44 per ton slag in the first comparison for 1904 in favor of the blast-furnace slag. The comparison for 1905 shows only 0 28% on copper difference, or $1 per ton in favor of the blast furnace. The difference of composition of SiO_2, and Al_2O_3, in the slag is trifling, being only 0.6% SiO_2 and Al_2O_3 in the first instance and 2.7% SiO_2 and Al_2O_3 in the second, but the blast-furnace slag contains less Fe and more CaO than the reverberatory, and lime is usually the cheaper flux of the two.

(No. 9) *What are the defining limits of each type in regard to slag composition?*

This is a difficult question to answer, but as zinc is but slightly volatilized in the reverberatory furnace, and I am now volatilizing about 60% of the zinc contained in the ore of the Great Western Gold Company in our blast furnace (which we intend to save with a bag-house in the near future, and by experimenting we expect to increase the amount volatilized), otherwise the slag would contain too much zinc to be handled. I consider that I am smelting as much, or more, zinc in the ores, in a blast furnace here than could be handled cheaply and successfully in a reverberatory plant. Our charges here, including lime-rock, contain on an average 15 to 18% ZnO and 10 to 14% $BaSO_4$, yet I am experiencing no difficulty with the furnace assisted by hot blast. The furnace would no doubt have greater smelting capacity with a cleaner ore.

(No. 10) *How do these differences in slags figure out in financial margins per ton smelted?*

This has been sufficiently answered by the comparative analysis of slags already given.

(No. 11) *What method of charging do you advocate for a copper furnace (assuming the atmosphere to be oxidizing)?*

I would advocate the automatic method of charging all large blast furnaces and reverberatory furnaces, excepting in a case similar to ours here, where we have so much zinc to volatilize in the blast furnace.

(No. 12) *Would you bind, in some manner, all fine for use in the blast furnace? Incidentally, what are the difficulties of treating fine ore in the blast furnace?*

No; I would not briquette all fine in the blast furnace, as there is such a thing as having the charge too coarse, but I would bind in some way all the material as fine as flue-dust or concentrate.

S. E. Bretherton.

Ingot, California, March 14, 1906.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—The problem presented by Mr. Burrows in your issue of February 24 is certainly interesting, and it is one that has probably not been encountered by many engineers.

Unless there is a strong probability that more than 1,000 tons per day will need to be hoisted, I should be inclined to favor the proposal of the manager to sink the shaft 5 ft. wide and of suitable length from the bottom of the present 10 by 10 ft. shaft. With this size and using the double-deck cages, the capacity should be considerably in excess of 1,000 tons per day, allowing for a proper proportion of empty trips, etc. A pumping compartment, 5 by 6 ft., should, in the majority of cases, be sufficiently large to accommodate the water-columns, steam-lines, air-lines, wires, etc., and yet leave sufficient space for a small cage running on cable-guides to be used only for hoisting men, tools, timber and other supplies. The cable-guides have the advantage that they can be readily removed to make room for any important work that may be necessary in the pump-compartment, and by having this cage controlled by a small independent hoisting-engine, its movements are entirely independent of the main hoist. If the jog in the shaft were made gradual enough, there should be no difficulty in the handling of the pump-columns and other lines, and I agree with the manager that it is usually found to be easier to handle the sections of the pump through the hoisting-compartment and so avoid the interference of the pipes in the pump-way.

Should there be, however, any great likelihood of a considerable increase over 1,000 tons, the 10 by 10-ft. shaft might be advisable, although the cost of sinking it would doubtless be more than one 5 by 16 ft. The 10 by 10 shaft would give the same hoisting capacity as the narrower section, and whenever the tonnage increased above the possibilities of the two hoisting compartments provided, the shaft could be enlarged to 10 by 15 or 16, as proposed. Instead, however, of making the larger shaft with four hoisting compartments, if the additional length were made to adjoin the hoisting compartments, all the hoisting could be done in two compartments. The Ellison shaft of the Homestake at Lead, S. D., and a shaft at Rossland, B. C., are sunk in this way, and I believe it was the plan of the latter to hoist two one-ton cars on each deck, although at the Homestake they planned to use a two-ton car. A shaft 9 ft. wide was also started in the Leadville district, but it was not carried to any great depth, and has since been abandoned. This, however, was simply a wild idea of the manager, and was not warranted by the tonnage which it was expected to handle.

The Yak Mining, Milling & Tunnel Co., at Leadville, have found it more economical to use a two-ton car in all their tunnel work, as one of these cars can be dumped almost as quickly as an ordinary mine-car. They are, however, too heavy for handling by a trammer underground, and unless some haulage system is installed, the two one-ton cars on a deck would probably be the more satisfactory and would take little longer to place on the cage.

W. Morton Webb.

Leadville, March 12, 1906.

ASCENDING SOLUTIONS?

The Editor:

Sir—In Mr. Jenney's interesting description of the Ontario & Daly-West vein system he ascribes the mineralization to *ascending* solutions, but does not detail the evidences by which that conclusion is reached. If he will consent to do so, I am sure his discussion of the subject will be read with the greatest interest by all those engineers who take up the consideration of the genesis of an orebody in connection with the probabilities of its persistence in depth.

Twice in the past year it would have been important in my examination of copper mines to know positively whether the ore came from below, above, or from the walls.

Martin Schwerin.

New York, March 11, 1906.

GOLD DREDGING.

The Editor:

Sir—If the questions in regard to gold dredging asked by Mr. J. H. Curle, in your issue of January 27, were answered by those who are competent to do so, the results would be of great value. I can contribute a little information concerning the failure of dredging in British Columbia. There were, I think, seven dredges on the Fraser river, near the town of Quesnel, on the Quesnel river, and the Smoky, during the latter part of the '90s. All were failures, none had a chance of success, because in each instance an essential rule of good practice was ignored; in their entirety, they probably include every fault of dredge designing, construction and operation. The prospecting was almost nil, there was no drilling-rig used for the purpose, and no intelligent prospecting of any kind. In design and construction there were all kinds of faulty ones, including even a suction dredge. For managers, any kind of inexperienced man: a promoter, a doctor, real estate agents, anybody but a dredge-master. In view of all this, how could there be any other results than failure?

Doubtless gold dredging in British Columbia will become an important industry as the country develops, and when operators know enough to dredge where the gold is, and also, know how to get it, but the payable, or probably payable, dredging area can not be estimated at this time. Twenty years hence, perhaps, a tolerably correct estimate may be given; at present it can only be said that vast areas are unexplored, and that hundreds of creeks in the known, or probably, auriferous areas are unprospected, and that the area of known dredging ground now available is quite limited. By "available," I mean ground not too remote from transportation facilities. Most of the ground to be dredged in this country is too wet to be prospected by shafts or paddocks; drilling is incomparably cheaper, costing about $5 per foot. If the right kind of rig is used, enough holes put down, and an experienced driller in charge, a close approximation of the ground's value can be obtained.

The conditions here are far from ideal; the season is short, from five to seven months; freight rates from the nearest railway point are from 4 to 10c. per pound; it is far from foundries and all supplies except certain food stuffs. However, because of these very disadvantages there are in this country dredging opportunities in much higher grade gravels than any now available in California. Needless to say that because of the evil repute of British Columbia, as a dredging field, the operator who has to go to the public for his money 'will strike a hard formation'; but if he has the money to put into a well-planned, well-executed and therefore safe dredging scheme, I know of no country more favorable.

Henry Boursin.

Barkerville, B. C., March 2, 1906.

Milling vs. Smelting in the Treatment of Tonopah-Goldfield Ores.

Written for the MINING AND SCIENTIFIC PRESS by FRANCIS L. BOSQUI.

The report that Mr. Charles Schwab has entered into a smelter contract for the treatment of his Nevada ore raises the question as to how far smelters can compete with local mills in the treatment of the silicious ores of the southern Nevada district. I have been for some time of the opinion that this interesting field does not offer an encouraging prospect to the smelter. Recent experiments have shown conclusively that the representative ore of the Tonopah-Goldfield district—not including, of course, the higher grade silver-lead ores of the outlying country—can be handled by modern mill-processes to far better advantage than by smelting, at the current freight and smelter rates. At Goldfield, at the present time, it is unlikely that the smelter, even with much reduced rates, can hope to compete with the phenomenally high extraction obtained from oxidized ore at the Combination Mines Company's mill, the only milling plant in the district in continuous operation. From other properties at Goldfield shipments are being made to the smelters, but only because of the lack of efficient reduction plants. A large and picturesque variety of small custom mills have been in desultory operation at Goldfield for a year or more; but these have been hampered by scarcity of water, in some instances by lack of capital for proper equipment, and, possibly, by unskilled management. The lively competition between these mills has resulted in the adoption of ridiculously low rates for custom-milling, and preposterous guarantees of extraction, involving a hard and unprofitable struggle. This has had the logical effect of discrediting milling in general, and has reacted somewhat in favor of the smelters. And until other mines follow the lead of the Combination Company and erect their own plants, this will probably continue to be the status of milling in the Goldfield district. It is true that the present scarcity of water in the immediate vicinity is a serious obstacle to milling on a large scale; but this is not by any means insurmountable if mine owners will only be convinced of the advantage of owning and operating their own plants.

At the Combination mill the expediency of treating ore under $50 per ton, where an extraction of 90% and better is obtained, is so obvious that no attempt has been made to ship material of this grade. In fact it has not been customary to send anything to the smelter under 20 oz. gold per ton.

The following interesting calculation of comparative net profits from shipping and milling high-grade ore from the Combination mine was made to determine to what point milling could be profitably carried. This table is based upon the Selby Smelting & Lead Company's schedule for September, 1905, as follows:

Value of ore per ton	Smelter discount, freight, and all expense of shipping	Net returns from smelter	Milling costs and losses in tailing, assuming $6 per ton for milling, and 90% extraction	Net returns from milling	Net profit in favor of	
$200	$48.20	$151.80	$26	$174	Milling,	$32.20 per ton
300	50.30	249.70	36	264	"	14.30 "
400	57.90	342.10	46	354	"	11.90 "
500	65.50	434.50	56	444	"	9.50 "
600	65.60	534.40	66	534	Shipping,	0.40 "
700	71.95	628.05	76	624	"	4.05 "
800	78.30	721.70	86	714	"	7.20 "

Freight rate from Goldfield to smelter, $22 per ton for ores assaying above 10 oz. gold per ton; with an increase of 3% for valuation above $300 per ton.

Smelter discount, $1.17 per oz. of gold for ore assaying under 15 oz.; smelter discount, $0.92 per oz. of gold for ore assaying between 15 and 30 oz; smelter discount, $0.67 per oz. of gold for ore assaying 30 oz. and above; $1 per ton haulage from mine to railroad depot; $3 per ton cost of sacks and sacking.

It will be seen from the above that at the Combination mine it is more profitable to mill than to ship ore running even as high as $600 per ton, assuming an extraction of 90%. And, in practice, ore of this grade is being used to 'sweeten' the lower grade material to make a milling product of about 5 oz gold.

It should be explained in this connection, and with reference to the above table, that milling costs and losses would be still further increased by the amount of discount, freight, and treatment of concentrate, cyanide products and bullion, reducing correspondingly the net returns and profit by milling. On the other hand, an increase of two or three per cent in mill-saving over 90% would very considerably raise the net returns from milling.

The following record of a working test made at the Combination mill, on comparatively high-grade ore, has a bearing on this point:

Tons treated, according to actual weight, 63.212; tons treated, by estimate of various products, 63.18, determined as follows: Slime, 14.4 tons; concentrate, 0.78 ton; sand, 48 tons.

Bullion recovery: 813.1 oz. amalgam, or 244.3 oz. bullion 0.942 fine, or 230 oz. fine gold.

Concentrate recovery: 0.779 ton, assaying 24.57 oz. gold, or 19.14 oz. fine gold.

Heading assay, sand, 2.4 oz. gold; tailing assay, 0.27 oz. gold.

Heading assay, slime, 2.065 oz. gold; tailing assay, 0.1425 oz. gold.

SUMMARY.

Recovered from bullion	230.0 oz.
Recovered from concentrate	19.1 "
Indicated recovery from sand	102.2 "
Indicated recovery from slime	27.7 "
Total gold	379.0 oz.
Loss in sand residue	13.0 oz.
Loss in slime residue	2.05 "
Assay of ore, per ton	6.23 "
Total gold in ore	394.05 oz.
Extraction	96.2 %

In the above statement it should be noted that the recovery from sand and slime is indicated only on the basis of careful sampling and assaying, as it was not practicable to make a cyanide clean-up from so small a lot.

A Custom Mill in the Desert.

In reference to the oxidized Goldfield ores, it may be stated that they are peculiarly adapted to milling. The gold is free, but most of it is so extremely fine that it does not readily amalgamate, and a complete cyaniding equipment for handling both sand and slime is absolutely essential.

The sulphide ore at the Combination mine yields to a somewhat different treatment, in which elaborate preliminary concentration is the chief feature, followed by cyaniding. The small quantity of concentrate produced from the oxidized ore will be treated by cyanide. The sulphide concentrate, however, does not yield to cyanide, and will no doubt eventually be chlorinated.

The Tonopah ores, which carry much silver, as well as manganese, a small quantity of copper and other bases, were for a long time considered unsuitable for milling. This view is no longer held by the leading mine managers. Tests now being made on a representative Tonopah ore at an ore testing mill in San Francisco show that an extraction of 90% by a combination of concentration and cyaniding may reasonably be expected in a properly equipped plant. The ore in question carries about 25 oz. silver per ton. If we assume $15 to be the average value of the milling ore in the district, an extraction of 90% and a milling cost of $3 per ton on a 40-stamp basis, we have a total milling expense and loss of only $4.50. This would be slightly increased by the cost of shipping concentrate; but even then the cost would be sufficiently low to discourage shipping and smelting. And if the high-grade ore of Goldfield can be more profitably milled than smelted, then the same rule should apply to the Tonopah ores. Indeed, every present indication points to the distinct advantage of milling over smelting as applied to the silicious gold and silver ores of this whole new district; and with the development of a better water-supply for milling purposes there is no reason why every property of any consequence in southern Nevada should not have its own independent reduction plant.

The Godiva Mill.

The concentration of ore by water is today receiving more attention in the State of Utah than in any other part of the world, and during the past year the State has been visited by many experts. The long series of experiments at the experimental mill of the Utah Copper Co., at Bingham Cañon, are nearly completed. A. J. Bettles is still grappling with the difficulties of stamp-milling the 'porphyry' ore, and E. A. Wall's plant at Bingham contains some novel and apparently worthy features. Gustave Overstrom, professor of metallurgy in the University of Utah, is now installing what promises to be one of the most complete concentration testing plants in the West. The mills mentioned are designed for the concentration of low-grade copper ore; they are to be described soon in these columns.

The treatment of the silver-lead ore of Utah has also been a troublesome problem. Mill after mill has been erected, only to be discarded after a short trial. The most recent work has been done by F. W. Sherman, in charge of the Daly West mill at Park City. Since the first announcement of the success of his experiment,* Mr. Sherman has erected a number of plants, employing his system of classification. That of the Godiva Mining Co., at Knightville, near Eureka, is to be started April 15. The accompanying drawings show sectional details.

An old ore-house was used as the first unit in the construction. Two additions were built, one at each end. This made a complicated arrangement, which could not well be avoided.

On examining section AA it will be seen that the coarse ore is given a preliminary crushing in a 12 by 15-in. Blake, breaking to one-inch size, all of which passes by gravity to the bin supplying the rolls, a set of 14 by 36 in. Details of these are shown in Fig. 1, in which it will be noted that the radical changes from standard rolls are a rubber compression spring and an emery-grinding brick mounting. The former consists of alternating plates of steel and rubber, which give a rigid roll for crushing, but will allow the passage of steel. The latter keeps the roll-surface in good condition.

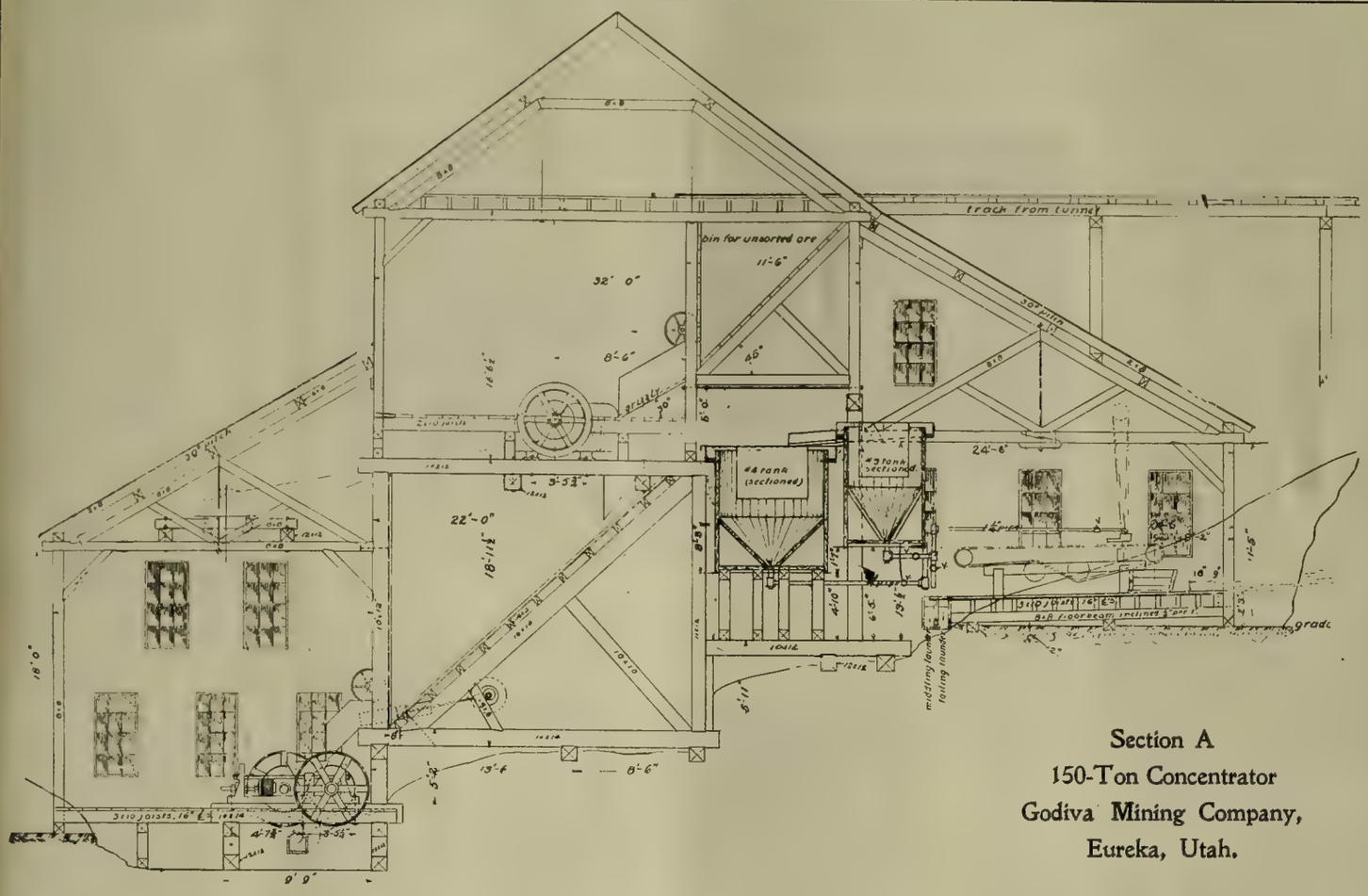
The product is elevated to the trommels, as shown in section BB. The oversize from the 3-mesh screen of No. 1 trommel passes back to the rolls. No. 1 passing and No. 2 oversize feeds No. 1 jig, and No. 2 passing feeds No. 2 jig. The jig tailing passes through a de-watering screen to the roller-mill, details of which are shown in Fig. 2. It is essentially of the Huntington type, equipped with compression springs that keep the rolls in place. It is supplied with special grit proof bearings and supports. It will also be noticed that the housing is in horizontal, not in vertical, sections.

The re-ground product from the roller-mill is elevated to four classifying tanks, the operation of which was described in the article already cited. The product of each of these classifiers is treated on Frue vanners; the overflow runs through six small settling tanks, their sediment feeding one table. The table tailing is passed through a launder to a cup elevator and carried down to the settling tanks, whence the overflow runs back through the system, supplying much of the water used.

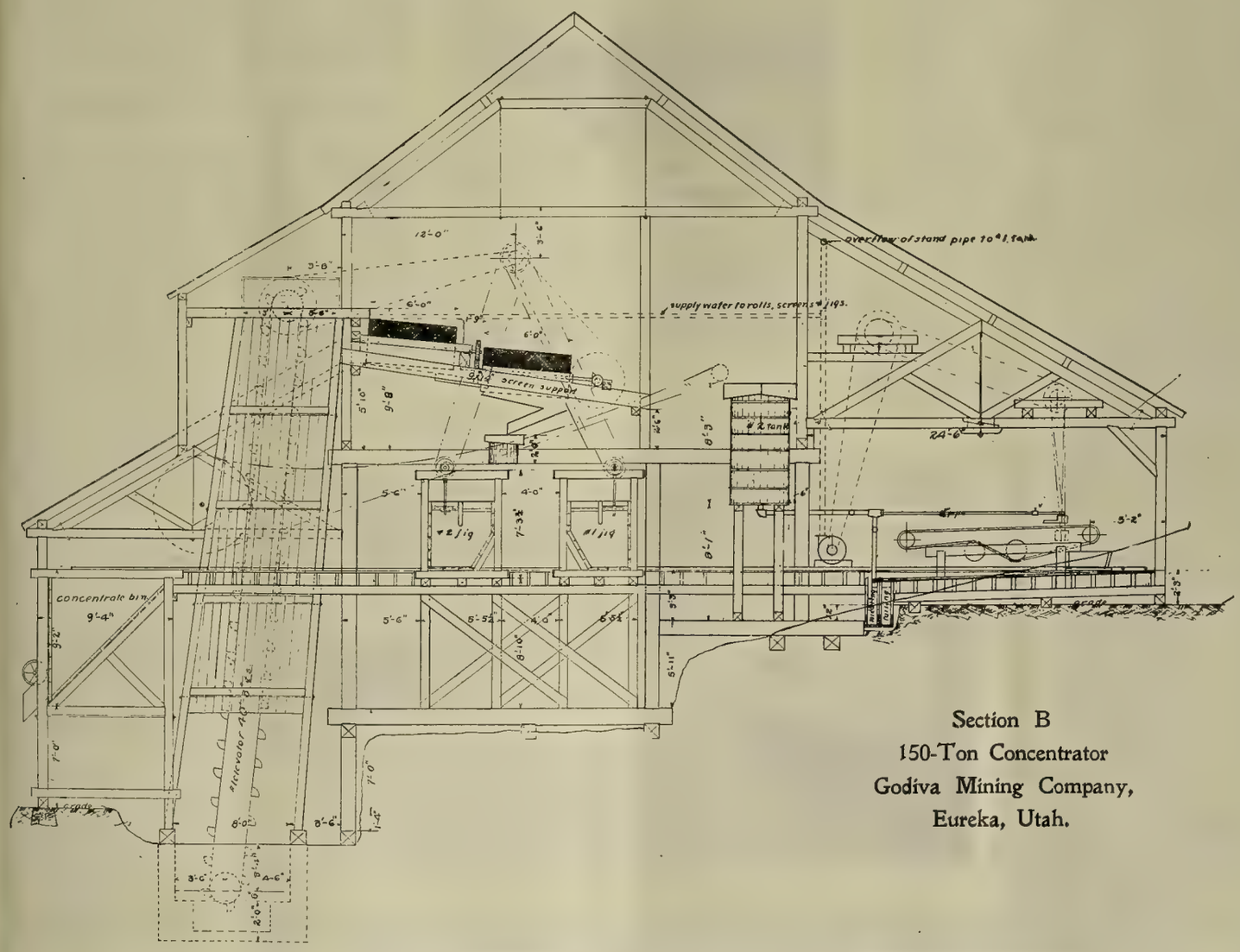
This system is economical, as the same water is used over and over again. After the plant has once been started, no fresh water is introduced except at the front of the concentrating tables. The water used in the rolls, screens, and jigs, and one-half that used on the vanners, is supplied by the overflow from the last fine-ore classifying tank. The plant was designed by F. W. Sherman, and has been constructed by J. G. Johnston.

ANTIMONY is a white, brittle metal, of laminated or crystalline texture. It fuses at a low temperature and readily vaporizes. It is not used in the pure state, but it forms several valuable alloys and compounds. The most important alloys of antimony are type metal, britannia, pewter and anti-friction metals. Type metals consist, essentially, of lead and antimony, often with the addition of small quantities of tin and nickel or copper. Britannia is a white metal alloy, antimony with tin, copper and bismuth, and is much used for table-ware. Pewter is a similar alloy, but it contains a smaller percentage of antimony than britannia. There are several anti-friction alloys which usually go under the name of babbitt metals. One of these consists of 50 parts of tin to five of antimony and one of bismuth, but other proportions are in use.

*'The Wet Concentration of Ores by the Sherman System,' MINING AND SCIENTIFIC PRESS, March 26, 1904.



Section A
150-Ton Concentrator
Godiva Mining Company,
Eureka, Utah.



Section B
150-Ton Concentrator
Godiva Mining Company,
Eureka, Utah.

Defence Against Snowslides.

The accompanying illustrations show the scene of the snowslide which came down last week on the Liberty Bell mine, near Telluride, Colorado. After the catastrophe of March, 1902, when 18 men lost their lives, a substantial barricade of cribbing and rock was built in the path of the slide, directly behind the tram terminal and boarding house. Most of these avalanches are annual; when sufficient snow has accumulated it descends along a path cleared through the forest in previous years; after an unusual snowfall, slides may succeed each other in the same place, but as a rule the big slide at any given locality descends once each spring, when the mass of late snows has gathered momentum so as to hurl it downward over the surface of the earlier falls. In the case illustrated, the slide of last week came down in the same place, and the barrier proved most effective in saving not only the buildings but many lives. Fig. 1 is particularly interesting, as showing how the snow was diverted from the buildings; the top of the barricade can be seen and a man stumbling through the snow. Fig. 2 shows how the stub tram was swept away, while Fig. 3 indicates clearly that the barricade was nearly too short, for the vestibule of the tram-house has been partly demolished. The photograph gives an idea of the wide desolation of mountain-land, into the recesses of which the miner has penetrated, taking his life in his hand and willing to face many months of isolation from the busy life of the valleys far below.

Fig. 1.

Magnesite in California.

The magnesite deposits of California are the only productive ones in the United States, but very few of them are being utilized for the reason that the demand on the Pacific Coast is limited to four or five thousand tons per annum, and the freight rates to Eastern points are prohibitive. The imported material from Greece and Austria is that which is mainly used in this country, as it costs much less than California magnesite when freights to points of greatest consumption are considered. The calcined magnesite, usually in the form of brick, is recognized as the best material for lining basic open-hearth furnaces, cement kilns, etc., and may be employed to advantage wherever high temperatures and chemical reactions are detrimental to dolomite, chromite and silica brick. Large quantities of imported magnesite brick are used, but they are also manufactured in this country (from foreign material) at Layton and Pittsburg, Pa. A factory to manufacture them has recently been started in East Oakland, on the bay shore, opposite San Francisco, the material coming from the extensive deposits in the mountains at the meeting corners of the counties of Alameda, Santa Clara and Stanislaus. For several years almost the entire output of California has come from the large deposit in the vicinity of Porterville, Tulare county, though more small lots have been produced in Napa county. Like many other deposits of mineral character in this State, only those may be profitably utilized which lie close to the railroad lines. Where haulage by team any distance is necessary, the deposits can not compete with similar ones near the main line tracks. For these reasons most of the Napa and Sonoma county deposits are now idle. Magnesite is found in several counties of the State, but only a few mines have been opened. By reason of the opportunity of over-production in view of the limited local market, the prices are not quite so well sustained as formerly. Crude material by carload lots may now be delivered f. o. b. at the mines at $2.50 per ton, and the calcined brings now about $14 to $15 per ton, whereas it was formerly a few dollars per ton higher. The crude material shipped to this city is utilized in the manufacture of carbonic acid gas, which, on being liquefied, is sold in steel cylinders and used by soda-water manufacturers, in factories, refrigerating plants, breweries, bar-rooms, etc. To obtain this gas the crude magnesite is calcined and the remaining calcined material is sold to the manufacturers of wood-pulp paper, where it is transformed into a sulphite of magnesia and used as a digester for the wood pulp. After being used for this purpose, a little lime is added and the 'pearl hardening' of commerce results.

Fig. 3.

It is generally reported that the Rio Tinto Company, the largest producer outside of the United States, had sold its output so far ahead that it was not inclined to offer any more metal at present. Large American producers find themselves in about the same position, while supplies of spot copper are still decreasing. The American consumers of copper are booking orders for their product in by far the largest volume in their experience for this time of the year, and this assures a renewed and sustained demand for the raw material, which will at least have a tendency to maintain the price.

Fig. 2.

Mining Regulations in China.

Consul-General Ragsdale, of Tientsin, forwards a copy of the new Chinese rules and regulations for mines and mining, of which the following are the chief points: The Chinese board of commerce has drawn up 24 articles for the investigation of mines and mining interests in the provinces, and these having been approved by imperial order have been added to the mining regulations sanctioned some time ago. All offices in connection with mining, such as K'uang-wu, Tsang Chu, Ch'a Kuang, Kung So, and others, shall be converted into mining investigation offices for the sake of uniformity. The Tartar generals, viceroys and governors are to select and recommend officials of experience and uprightness who are qualified to be directors and engineers of mining. These shall make surveys and make detailed reports. They must also report on the workings of all present mines, whether by natives or foreigners.

Anyone hindering mining development or investigation by private working or by pleading Fengshui (the interference of the heavenly spirits) will be punished. Merchants or people who need the service of a mining engineer from the office are to provide all expenses. A laboratory is to be attached to each mining investigation office, consisting of two departments—one for experiments, the other for operations.

For the purpose of investigation on Government land, excavations are necessary, and the cropper shall be notified to this effect and no resistance offered on his part. Should any damages be done to his products he will be indemnified by the mining office. Full accounts of the mineral deposits and the necessary steps for development must be filed with the board of commerce. Three classifications are required. If the mineral is of best-quality, transportation convenient, sale prospects large, coal or other fuel procurable, and the machinery can be put up at the spot, the mine may be put down as first class; if transportation is inconvenient, coal or fuel scarce, as second class; and if the mineral lies at great depth and is largely alloyed with other substances, as third class. Notes must be taken as to which mines require native methods and which require machinery.

How to Make Paint Adhere to Zinc.

A writer in *Popular Mechanics* recently explained his method of overcoming the difficulty of making paint adhere to zinc, his desire being to make zinc be the support of a plate surface, and painting the surface with a paint composed of shellac in alcohol containing a solution of pumice stone and lampblack. The method employed was as follows:

A portion of the 'paint' was diluted with alcohol and the surface of the zinc well sand-papered while thoroughly wet with the solution—the intention being not to allow any of the surface to come in contact with the air during or after the operation of sand-papering. The paint was thick enough to cover thoroughly as it dried. When every part had been gone over thoroughly, a number of coats were added, in order that the low places might be filled up and the surface ground with pumice stone. Time has proved the success of this experiment. Many years have gone by, but the coating holds perfectly, and the matter is now brought forward with the hope that the suggestion may have useful application in ordinary painting. The theory on which this experiment was based is that zinc oxidizes instantly wherever a fresh surface is exposed to the air. This oxide is so thin that it is not visible. Nevertheless, it is present, and forms an unstable attachment for the paint as commonly applied, thus preventing the same from coming in absolute contact with the metal itself. The sand-papering operation, under cover of the wet paint, produces a different condition of things.

NIAGARA FALLS.—The first permanent aluminum cable which supplies the Niagara, Lockport & Ontario Power Co., with power from the Ontario Power Co., was stretched across the Niagara gorge, just below the whirlpool, in January. The transmission line will extend from this point to Syracuse. A contract has been made by this company for 25,000 h. p. to be used in the electrification of New York Central branch lines.

On the Formation of Garnet Zones at the Contacts of Eruptive Rocks and Limestones.

Written for the MINING AND SCIENTIFIC PRESS by JAMES F. KEMP.

It has long been known that certain types of ore deposits favor the contacts between igneous intrusions and their walls of sedimentary rock, but the recent great interest in copper mining and the many new properties which have been developed have brought these contacts into greater prominence than ever before. Copper ores are pre-eminently found where eruptives have penetrated limestones and have brought to pass the 'garnet zones,' an expression which has become part of the common speech of the mining profession. The present paper aims to set before the readers of the PRESS the essential points which geologists have worked out regarding the zones, in the hope, not alone of making them the better understood, but of placing at the command of observers actually engaged in mining the course of reasoning by which the conclusions have been reached. At the same time the points may be emphasized upon which additional testimony is needed.

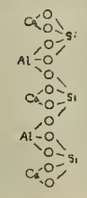
Eruptive rocks that penetrate sediments often exercise upon them profound effects in the way of re-crystallization; they tend to form, locally, new assemblages of minerals which constitute the so-called 'contact zones.' The changes are somewhat irregularly produced and impress an observer no less by their extraordinary development in some places than by their failure to appear in others. These irregular occurrences have been best explained by the suggestion that emitted vapors or solutions are mainly responsible for them. Where the emissions were abundant, the contact minerals appear; where they fail, the zones are lacking. Dry heat does not seem to involve all the necessary factors. Yet this point is one which the student of a new district ought to keep in mind and test in the field.

The nature of a sediment also, to a great degree, determines the result. From pure quartz-sandstones we can expect little else than consolidation by the solution and re-disposition of more silica. From shales which consist chiefly of quartz and kaolin, we would anticipate silicates of alumina, since silica and alumina are the chief components. It is natural, therefore, that andalusite, Al_2O_3,SiO_2, should be the characteristic mineral of such zones. Sillimanite, likewise Al_2O_3,SiO_2, is also common. Should there be, as often happens, some iron oxide, or some magnesia or lime in the shale, we may expect staurolite, $HAl_5FeSi_2O_{13}$ or $HOAlO, 2Al_2O_3FeO,2SiO_2$; biotite $(MgKH)Al_2(SiO_4)_3$, and now and then a garnet.

When limestone constitutes the walls, the simplest result is to change them to marble; and often when they are fairly pure calcium carbonate, this beautiful, white crystalline rock is almost the sole result. Marbles thus produced are sometimes looked upon with favor as ornamental stones, but it is rare that they are sufficiently uniform in grain or regular enough in cleavage to answer. Spots and checks of contact minerals are the rule, and indicate the places where other bases were present in the original rock.

If we imagine the original limestone to have been impure or earthy, we know that the admixture of foreign material would add to the carbonate of lime the following bases, magnesia and iron oxides as carbonates; alumina as the hydrated silicate, kaolin, $2H_2O,Al_2O_3,2SiO_2$; and free silica, in the form of comminuted quartz. From the new combinations of these bases with silica, a variety of minerals may form under the influence of the heat and heated vapors or solutions from the eruptive. Thus the most natural is the mineral wollastonite CaO,SiO_2, and this we find not uncommonly, and sometimes in great abundance. The next in simplicity of composition is the variety of pyroxene, diopside, which contains both CaO,SiO_2 and MgO,SiO_2, often with a trace of FeO,SiO_2. Tremolite, the amphibole of practically the same composition, is not common, although not entirely unknown. This seems surprising, because it is a frequent component of marbles produced by regional metamorphism.

As we pass to the next more complex mineral we meet garnet, which is on the whole the most widespread and characteristic of those present. Garnet is the name of a group of minerals, each of which involves a protoxide and a sesquioxide base. They are all salts of orthosilicic acid, H_4SiO_4, of which we have three molecules with 12 bonds of affinity. These 12 are satisfied with three dyads and two triads, and the several varieties of garnet are due to the different combinations. Thus, grossularite, one of the commonest, contains $3CaO,Al_2O_3,3SiO_2$, which we may expand in a graphic formula as follows:

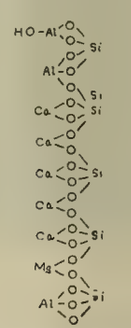


Grossularite really means 'gooseberry stone,' the name being derived from *grossularia*, the botanical name of the gooseberry, and the allusion is to the pale green color and, of course, rounded crystals of some varieties; but we also find yellowish and light brown varieties as well. Cinnamon stone or cinnamon garnet, both common expressions, refer to those with the latter hues. All who have seen garnet zones will recall the frequency of greens and browns, especially in the dense, massive mineral with its peculiar, greasy look.

But we have reason to believe that with the grossularite there is often a large admixture of the lime-iron garnet, andradite, $3CaO,Fe_2O_3,3SiO_2$, and probably to a degree not generally appreciated. This is also light green, yellow, yellowish brown and even darker in its color, and may without analysis be easily mistaken for grossularite. In fact, upon this point there is much need of additional records of actual quantitative composition, since the general disposition of writers has been to call the garnet, grossularite; and reason about it upon this basis. Later on, this point will be again referred to, but it may be remarked, in passing, that iron oxide in its general relations is a more soluble base than alumina, and, as far as we know, may be supplied to the limestone from outside sources during re-crystallization more easily than alumina.

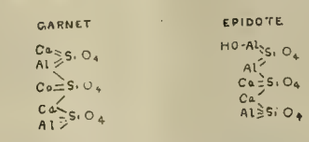
The two lime garnets, grossularite and andradite, are naturally to be expected along limestone contacts as the predominating varieties, but there seems to be no reason why we should not also find at times the iron-alumina variety, almandite, $3FeO,Al_2O_3,3SiO_2$, and even still others, since all of their components are obviously present; nevertheless, experience hitherto justifies us in emphasizing the ones first named and in merely mentioning the others as not improbable.

Of wide occurrence with the garnets are two other lime-silicates, vesuvianite and epidote. Vesuvianite was named because of its frequent development in the limestone blocks which are torn off by the uprising column of lava from the limestone walls of the conduit at the volcano, Vesuvius, and which are then cast out upon the slopes of the crater. Vesuvianite is a more complicated molecule than garnet, but it is nevertheless a not difficult one to understand. Its composition as given by Dr. F. W. Clarke is $5CaO,MgO,Al_2O_3,AlO,OH,5SiO_2$, which means that five molecules of H_4SiO_4 have been combined with five of lime, one of magnesia, two of alumina, and one aluminum, of whose three bonds two are satisfied by one oxygen and one hydroxyl, HO. Expanded graphically, vesuvianite becomes



It often happens that considerable FeO may replace the CaO, and some Fe_2O_3 the Al_2O_3; yet it is clear that we are dealing with essentially the same components as in the case of garnet, and that all of them are such as to be expected under the circumstances.

Epidote is closely akin to garnet in composition, its formula being the same three molecules of H_4SiO_4, whose twelve bonds of affinity are satisfied by two aluminums, two calciums, and instead of a third calcium, as in garnet, a third aluminum, one of whose bonds is already satisfied by hydroxyl. Thus aluminum, with two unsatisfied bonds, may take the place of one dyad calcium. Ferric iron may, and does in large part, replace the aluminum just as in garnet. Epidote and garnet may thus be written side by side,



In studying a garnet zone, therefore, it is important to first determine accurately these several minerals, and then selecting specimens of as great purity as possible, submit them to analysis to decide upon the actual composition of the minerals present. If the mineral is finely crystalline, the microscope alone enables us to make precise determinations; and unless we have reasonably accurate determinations, we cannot of course draw well grounded conclusions.

Beside the lime-silicate minerals already mentioned, magnetite in bodies of considerable size is not infrequent in the zones. Specular hematite, often called specularite, is a common associate, and chalcopyrite or lean copper-bearing pyrite is the usual mineral which gives economic value to the deposits. Quartz likewise appears in veinlets and druses. Fluorite, molybdenite and a few other minerals make up the list of these rare ones. They do not affect in any marked degree the large features of the problem upon which it is here the desire to focus attention.

It is evident that to produce the compounds mentioned there must be either a combination of the silica, alumina and iron of an earthy limestone with the lime of the calcite, attended with the elimination of great quantities of carbonic acid; or else there must be the contribution, from the eruptive, of the silica, alumina and iron to a pure limestone with equal elimination of carbonic acid. From one or the other of these interpretations somewhat important deductions are to be drawn, as will be later shown; and to the determination of this question close attention should be paid by an observer in a new district.

If, for example, an intrusive rock cuts a series of sediments involving several different kinds of limestone; and if we find contact zones where the limestones are known, by analyses or by visible inclusions of chert or by evident shaly character, to be impure; then we naturally conclude that the lime-silicates have been formed out of the materials originally in the sediment. The conclusion would be corroborated were we to observe also that where the eruptive cuts the beds of pure calcite, only marble appears. These were the relations observed by Dr. Joseph Barrell near the Elkhorn mine, Montana, and described several years ago.*

Professor W. O. Crosby† found in Washington Camp, Arizona, that the zones were developed in a cherty limestone and that rims of wollastonite might even be recognized surrounding unaffected nuclei of chert. The zones followed the cherty streaks for a distance from the eruptive, and now appear in the midst of the enclosing sediment which is itself at most changed to marble. Professor Crosby naturally concludes that the garnet zones are the results of the re-crystallization of the cherty limestone, although he does not give any analyses to show that the necessary alumina, to afford the 22.7% required by grossularite, is in the rock.

This general statement and the two cases cited, undoubtedly represent the usual view, and where the coincidence of impure strata and garnet zones appears, the interpretation is well based.

But, on the other hand, I have described in detail, with analyses, a case in the State of Tamaulipas, Mexico,‡ where the limestones were not earthy and where they contained in the cases tested but 4 to 5% SiO_2 and less than 1% Fe_2O_3 and Al_2O_3. It seemed impossible to re-crystallize from raw materials of this character garnet in thick zones and yielding on analysis 37.15 SiO_2, 6.98 Al_2O_3, and 19.40 Fe_2O_3. The zones surrounded huge blocks of the limestone included in a laccolithic mass of eruptive rock, and there is no escape from the conclusion that from the eruptive must have come the necessary silica, alumina and iron oxides.

These cases will serve to bring out one of the crucial points in the whole study of the contacts, and one upon which more testimony, fortified by analyses, is desired. The general association of the minerals is now understood, but before indulging in explanations of origin we emphatically need to know the actual composition of the original rocks which are believed to have undergone the changes, and the composition of the end-result. We may then speculate intelligently as to the nature of the process. Perhaps it is not too much to hope that chemists at smelters or assayers at mines, dealing with these ores, may, in spare time, make the determinations, once the connection is seen.

To Prof. Barrell, whose work was cited above, we also owe an exceedingly important and acute suggestion. Starting with the belief that the zones were produced by the re-crystallization of materials already in the limestones, and with the fact that as present in the sediments these materials were in the form of calcite, CaO,CO_2; magnesite, MgO,CO_2; kaolinite, $2H_2O,Al_2O_3,2SiO_2$; limonite, $2Fe_2O_3,3H_2O$, and quartz, SiO_2, he was able to show that the combination of the silica with the lime, magnesia, alumina and iron oxide, one or several, involved the elimination of the carbonic acid and the water. Thus, if we have 100 parts of a sediment containing

41.7	Kaolin, $2H_2O,Al_2O_3,2SiO_2$
9.8	Quartz, SiO_2
48.5	Calcite, CaO,CO_2
100.0	

it will yield

72.8	Grossularite, $3CaO,Al_2O_3,3SiO_2$
21.4	Carbon dioxide, CO_2
5.8	Water, H_2O
100.0	

The carbon dioxide and the water, 27.2% of the whole by weight, pass off and, therefore, leave a series of empty spaces.

If, now, we divide the above percentages of kaolin,

*Physical effects of Contact-Metamorphism, *Amer. Jour. Science*, April, 1902, 290. Weed and Barrell. *22nd Annual Repl.* U. S. Geol. Survey, Part II, 399.

†*Bulletin*, Amer. Inst. Min. Eng., Nov., 1905, 1217.

‡*Bulletin*, Amer. Inst. Min. Eng., July, 1905, page 885.

quartz and calcite by their respective specific gravities, we will obtain their relative volumes:

41.7 ÷ 2.5 = 16.7 volumes of kaolin
9.8 ÷ 2.6 = 3.8 volumes of quartz
48.5 ÷ 2.6 = 18.7 volumes of calcite

39.2 volumes of minerals in the sediments.

If the general term 'volumes' proves confusing, we may call them cubic inches. Then a mixture of 16.7 cu. in. kaolin, 3.8 cu. in. quartz, and 18.7 cu. in. calcite, will have of each, by weight, 41.7% kaolin, 9.8% quartz and 48.5% calcite.

After the metamorphism, we have grossularite remaining, while carbon dioxide and water pass off; 72 8% grossularite divided by 3.5, its specific gravity, gives 20.8 volumes of grossularite, 39.2 – 20.8 = 18.4 volumes of the original sediments lost as evicted gases; 18.4 divided by 39.2 indicates 47% by volume lost. That is, if we were to have sediments of the above composition re-crystallized by contact metamorphism, the resulting rock ought to have 47% of its volume open spaces. All these calculations are adapted from the paper of Dr. Barrell in the *American Journal of Science* as cited above.

We may now test these calculations by experience. In the first place, do we ever have a sediment of the composition assumed above? When re-cast, the mixture of kaolin, quartz and calcite, which yields grossularite, is

SiO_2	29.1	
Al_2O_3	16.6	
CaO	27.1	Calcite 48.5
CO_2	21.4	
H_2O	5.8	
	100.0	

Limestones of this general composition are not unknown, although not especially common. Thus, if we look through the 988 analyses which have been compiled by Dr. Heinrich Ries in *Bulletin* 44 of the New York State Museum, we will find that something under five per cent of those given will be suggestive, and they are mostly earthy limestones such as might be considered for hydraulic cement. Thus, a rock from New Lisbon, Columbiana county, Ohio, Analysis 726 of Ries, or Ohio Geol. Sur. V. 1109, gave the No. 1 quoted below. Another, No. 2 below, or No. 589 of Ries, is the portland cement rock, near Belvidere, N. J., from the N. J. Geol. Survey, 1900, p. 95. Finally, No. 3 is the grossularite mixture repeated for comparison.

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	CO_2	H_2O
(1)	36.69	15.17	4.82	15.24	3.73	16.07	7.6
(2)	27.9	7.89	1.7	32.1	1.4	26.78	...
(3)	29.1	16.6	..	27.1	..	21.4	5.8

From a limestone having the composition of the first analysis with its high SiO_2, diopside or wollastonite would be quite certain to crystallize in addition to garnet. The same is true of the second on account of the low alumina. Hence, in general, we recognize that limestones adapted to yield the zones of lime-silicates are well known.

But we may get some light upon the question as to whether or not the eruptive has contributed silica, alumina and iron-oxide by observing whether the garnet zones exhibit 47% of voids or some similar amount which would be yielded by the re-crystallization of sediments. If we find them, then the case is favorable to the re-crystallization of materials already present. On the other hand, if the zones are dense or very slightly cellular, as has been the case in some instances, their development without contributions would be impossible. The new silica, alumina and iron oxide would, of course, take the place of the ejected carbon dioxide and leave few if any empty spaces. No interpretation of the phenomena can be adequately developed without considering these points.

Again, if we find large bodies of magnetite along the zones, mingled with garnet and copper ore, and yet have no reason to infer proportionate percentages of iron in the limestone, an additional point of evidence looking toward outside contributions is afforded. Or if the feldspars, orthoclase or albite, appear in the zones, both being foreign to limestones and yet natural contributions from an acidic eruptive, we find another bit of evidence.

So far as the temperature of the processes of re-crystallization are concerned, the recent investigations of Messrs. E. T. Allen and W. P. White, of the United States Geological Survey,* have given us some reliable data. These two investigators have carried on some careful experiments upon the behavior of wollastonite and have produced it artificially under circumstances admitting of accurate heat measurements. They find that wollastonite cannot be produced under normal pressures above 1,180° C. At the higher temperature pseudo-wollastonite results, a mineral not known in nature, and of a different crystal system, although of the same chemical composition. As pseudo-wollastonite cools, it reverts to wollastonite at this critical temperature, unless special precautions are taken. From a glass of the composition of wollastonite, obtained by quenching a melt in water, the mineral crystallizes as low as 860° C. The fusing point of the acid eruptives which are the common products of the zones is believed to be somewhat above 1,200° C., and when injected the mass may have been much higher. So far as wollastonite is concerned, therefore, the temperature of its formation could not have been higher than 1,180° C., and may have been 200 or 300° lower, so that it would appear to result during the cooling stages but while the eruptive and its bounding walls were still highly heated.

Another interesting topic in connection with the zones is the determination of the order in which the minerals have crystallized. Just as in the study of the eruptive rocks, if we find one mineral tightly enclosed in another the outer one is later than the inner one. If we find a well crystallized one sharply abutting against another that molds around it, the good crystal is the older. If we find veinlets cutting across other minerals, their filling is later than the walls.

In the zones we often see veinlets of quartz and calcite cutting the lime-silicates or the same minerals forming crusts over the linings of vugs and druses, and therefore clearly the last to form. In the latter relation we note also chalcopyrite and may not infrequently cause it to break away from well-developed garnets, leaving impressions of the latter. Chalcopyrite may also be seen in veinlets cutting through the masses of magnetite and must therefore be classed among the late introductions.

Black Bear Adit, Le Roi Mine.

But it also appears as inclusions in the lime-silicates and gives evidence at times of dating well back to the early stages of the process, so that evidence is at hand leading to the conclusion that its introduction has been quite continuous. When the chalcopyrite undergoes oxidation it yields chrysocolla as its most frequent product provided no calcite is near to precipitate the carbonates.

Beside the usual run of experience mentioned above, there are others less common and forming notable departures from the rule. Mr. F. L. Ransome, for example, has described the exceptional case at Bisbee, Arizona, where there is next the eruptive a zone of quartz and calcite a thousand feet across. Outside of this comes the dense and finely crystalline belt of the lime-silicates containing the orebodies. Again, as at San Pedro, New Mexico, Washington Camp, Arizona, and Nombre de Dios, Durango, the metamorphism has spread along certain beds to a considerable distance from the eruptive. One may question whether this relation is due to the especially favorable, original composition of these beds; that is to their silicious, aluminous character, or to their more open texture, so that heated solutions or other exhalations from the eruptive found their way along them and developed garnet and its boon companions. Many such questions will confront the thoughtful observer when face to face with actual cases.

The contact zones, in conclusion, are extremely significant in their general relations to the problems of the ordinary veins, which are connected more remotely than they are with igneous phenomena. The zones give us a positive and tangible result of igneous influences; afford a point of departure from which to lay out a traverse into the hazy regions of speculation, and as regards the source of their minerals, whether non-metallic or metallic, they present fewer difficulties. They therefore deserve study, not alone for their own inherent interest, but because they shed light upon questions which greatly need it.

*On Wollastonite and Pseudo-wollastonite, *Amer. Jour. Sci.*, Feb., 1906, 89.

The Le Roi, Centre Star and War Eagle Mines.

Written for the MINING AND SCIENTIFIC PRESS by D'ARCY WEATHERBE.

The names of this group of mines probably convey more of the concrete to the average mind than those of any others in British Columbia, not altogether on account of their richness, production or prospects, but chiefly because their development is contemporaneously bound up with the famous boom of 1896 and its collapse about 1899. These three mines were located in 1890 and the discovery ore assayed from $25 to $40. Their subsequent financial history is much involved in litigation and the maneuvers and schemes of capitalists. Nevertheless production has continued fairly steadily since 1894 and still goes on apace.

The output of ore shipped from and crushed at the three mines during the year ending December 31, 1905, was as follows: Le Roi, 110 838 tons; Centre Star, 95,550 tons; and War Eagle, 61,500 tons. The previous tonnage up to December 31, 1904, was, Le Roi, 974,785; War Eagle, 240,455; Centre Star, 226,648. The average value of the above tonnage was about $16 per ton in gold, silver and copper.

These mines are situated on the southern slope of Red Mountain at an altitude of about 3,600 ft. above sea level and about a mile from Rossland, a town of 6,000 people, situated on a shelf of the mountains below the mines. The sketch (Fig. 1) shows the relative position of the properties and roughly the positions of the shafts and the strike and dip of the veins. The geological conditions have been ably described and mapped by the Canadian Geological Survey and by Edmund B. Kirby, a former manager.* The rock in which the veins occur is augite porphyrite, generally of a dark grayish color and crystalline texture varying in coarseness, though in the lower levels fine-grained ash rocks are seen, so changed by pressure and other metamorphic action as to resemble, in the schistosity developed, the bedding of slate. The veins are fissured zones of the country rock, the latter having been replaced by pyrrhotite through aqueous agency. Later enrichment by the same process has deposited chalcopyrite and gold at specially favored spots throughout the friable pyrrhotite.

Numerous trap dikes intersect the veins, generally at an acute angle and often accompanied by faulting. These dikes vary in crystalline texture more than the surrounding porphyrite, and range from a fine-grained rock to one containing crystals of augite plagioclase and patches of quartz, etc., occurring as large as three-eighths of an inch in diameter. From the fact that these, in some cases, contain mica (generally biotite) and sometimes do not, they are roughly classed at the mine as 'mica' and 'non-mica' dikes. Their effect on the enrichment of the orebody is not often clear, though they plainly acted as barriers to the deposition of mineral, as shown by Fig. 2, which is a sketch of part of the 700-ft. level in Le Roi mine adapted from Mr. Kirby's description.

CENTRE STAR MINE.—The vein dips at an angle from 62 to 75° in the direction shown in Fig. 1, and is entered by a shaft on the dip now over 1,600 ft. deep vertically. This is divided into three compartments, two for hoisting and a ladder-way. Cages with skips suspended beneath are used and are supplied with a safety-hook to prevent overwinding. This is tested every week as are also the 'dogs' on the cages. Large stations are cut at each level and bins underneath deliver the ore into the skips. Nine levels have been driven and the shaft which is in process of sinking is 365 ft. below the No. 9 level. In the sinking, a steel tub hoisted by an auxiliary engine on the level is used; it is operated through the ladder-way, the main portion of the shaft being bulkheaded to prevent danger to the men working below. The hoisting machine used here is not geared, but is driven by a paper disk friction-pinion and is almost noiseless in operation. The method of timbering is by square sets. Originally square timbers (10 by 10 in.) were used, the posts placed seven feet apart at centers and with the caps butted as shown in Fig. 3. The posts are eight feet high. Instead of the greatest pressure being lateral as at first arranged for, it is chiefly from the top and the crushing of the caps resulted as shown in Fig. 3 and produced a point of weakness in the cap at its junction with the post. To remedy this, round timbers are now used and a tenon is cut on the posts six inches wide so that one post rests directly on the other (Fig. 4). The distance between posts has also been reduced to five feet four inches. On account of the extreme irregularity of the orebody and the numerous faults and dikes which displace it, diamond drilling and crosscutting are resorted to largely in exploring the ground. Under the best conditions, however, the diamond drill is a more or less unsatisfactory means of doing this work. Even crosscuts often fail of their object as will be shown by the following incident which will also illustrate the erratic nature of the deposits. Several years ago a crosscut was driven from the No. 5 level in the War Eagle mine to intersect a body of ore that had been proved close at hand by a drill-hole.

*The Ore Deposits of Rossland, *Journal* Can. Min. Inst., Vol. VII.

The crosscut was pushed considerably farther than the supposed position of the orebody; but nothing of value being discovered, it was abandoned. During the past year, however, on driving back on a portion of the vein that had been overlapped by faulting, a rich pocket of ore averaging $40 per ton was extracted and found to be literally within a foot or two of the crosscut! Over $26,000 was taken out of a small chamber on the level and the deposit is supposed to extend beneath the crosscut; a raise from the No. 6 level is now in similar ore.

The numerous comments and reports that, through ignorance, constantly appear in irresponsible periodicals regarding 'strikes' of ore, as they are termed, give to the uninitiated reader, and probably to the foreign stockholder, entirely false impressions, and must often be responsible for much of the bewilderment that exists in the minds of the latter. Doubtless, too, they are the mischievous cause of much of the bickerings and machinations that go on among the directorates of companies controlled by foreign capital. Two recent instances, at the above mines, may be cited as an illustration. Early in February several reports appeared, and were copied, of an enormous strike of ore that had been made on the eleventh level of the War Eagle mine. As a matter of fact, the management had for months been driving their usual crosscut from the shaft at the eleventh level to intersect the vein at the point of the so-called strike, the ore having been previously proved by a bore-hole; and although there was the same chance of local change in the orebody as has been exhibited at other places in the mine, yet the intersection of the vein at this point partook in no way the character of a *discovery* such as would be intimated by such newspaper reports. With regard to the so-called 'strikes' in Le Roi mine, west of the Josie dike, the chance of finding ore exactly where anticipated might be slightly less than in the above case, but the laborious and expensive development work carried on previous to encountering the orebody again was nicely calculated, both as to time and place. It is rather hard that the carefully thought-out plans of these and other capable managers should, on their successful culmination after months of toil, be ruthlessly assigned to chance by some scoop-gatherer.

As noted above, these mines have attained a vertical depth of 1,650 ft. and, so far as I was able to gather, still show promise in depth. The Centre Star vein has been traced easterly for a long distance, but beyond the mine it has not yet been proved in depth. The proving of the continuity of Le Roi orebody beyond the Josie fault opens up a large area of ground and several other veins occur on these and adjoining or near-by properties which, on testing, may reasonably be expected to warrant the continued permanence and prosperity of the camp.

The workings on the War Eagle vein are connected by crosscut with the Centre Star mine; the method of working is practically the same as at the Centre Star, though the vein is found to flatten as depth is gained, and at the No. 11 level a crosscut, 750 ft. long, from the shaft was found necessary to reach it. Fig. 5 is a section through the War Eagle shaft and shows the flattening of the vein, which at the bottom appears to be pitching at a steeper angle. It is intended to discard the shaft and headworks of the War Eagle mine, and tram all the ore from here to the Centre Star, where the plant will be centralized.

The ore from both the Centre Star and War Eagle is dumped over coarse and fine grizzlies and the oversize is hand picked. At the surface the Centre Star waste is trammed by electric motor (see photograph), hauling 12 cars of two tons' capacity each to the dump trestle. The cars underground are from 1,500 lb. to one ton capacity, but are seldom filled to the top.

At Le Roi mine the methods of working are similar to those employed in the other Rossland mines, though the orebodies and consequently the stopes are generally wider (up to 140 ft.). Round timbers are used in the sets. The posts are eight feet high and are placed five feet four inches apart; the caps are butted. The shaft is 1,350 ft. deep vertically, and below the 1,350-foot level a winze has been sunk for 300 ft. The shaft is of five compartments, as per sketch. The cages in the two compartments, 5 ft. 4 in. by 4 ft. 2 in., are used for men and timber and the other two compartments, 6 by 5 ft., are for ore and waste. The skips in these larger compartments have a capacity of four tons each. The cars underground hold about 1,600 pounds.

At the 300 ft. level an adit called the Black Bear tunnel runs out to surface, and through this all timber and supplies are taken underground. Air, steam and discharge pipes and electric wiring also are carried through this level. (See photograph.) A Smith-Vaile triplex pump, size 7½ by 15 by 3, at the 900-ft. level, pumps eight hours per day and lifts 60,000 gal. to surface. It is run by dynamo. A No. 3 Knowles pump at the old East shaft, on the same level, pumps three hours per day and discharges at the sump of the Smith-Vaile pump. On this level there is also another Knowles plunger pump, outside packed, 16 by 8 by 12, which is installed as a reserve. At the 1,350-ft. level a Cameron station pump, 16 by 7 by 12, runs eight hours per day and lifts to the 900-ft. level. The other pumps, a Knowles 10 by 4 by 7 and a Knowles 8 by 3 by 10, are used in tandem in case of accident to the Cameron pump. On the surface the timber shed contains a timber framing machine; this is operated by air power and has proved economical both in time and labor. An extensive machine-shop which aims to supply all parts required, except castings, is run by compressed air.

The boiler plant includes two Heine water-tube boilers, 125 h.p. each; three Fraser-Chalmers return tubular, 100 h.p. each; three Jenckes, 90 h.p. each; three Jenckes, 80 h.p. each. The remainder of the surface plant is as follows: Two Rand cross-compound condensing air compressors, with inter-cooler; stroke of each, 48 in.; gauge pressure, 100 lb. These supply 3,360 and 3,000 cu. ft. of free air per minute, respectively.

The hoist for cages was built by the Vulcan Iron Works. It is a double-drum, steam-driven, link-motion, balance-valve, direct-acting friction-hoist. The friction band-brake and reversing gear are handled by auxiliary air engines. The horsepower is 300. The hoist for skips (Fraser-Chalmers) is a double-drum, link-motion, reversing friction engine, with post-brakes, which, as in the case of the man engines, are handled by auxiliary air-engines, as is also the throttle. The sheaves for skips are 12 ft. diam. and the sheaves for cages are eight feet. The ore is crushed by one large Gates rock-breaker, then passes over a coarse grizzly, the oversize going back to the rock-breaker; the three products are fed separately from bins to three picking tables. The compressors supply air to 21 Sullivan drills (3⅜-in. cylinders), and to 7 or 8 Mack drills used in the adjoining Josie mine, to all the underground pumps enumerated above (except the electric pump on the 900-ft. level), the saw-mill engine in the timber shed, the hoist at the Josie mine concentrator, the air-lift doors at the station ore-bins in Le Roi, two fire-pumps on the surface, a Snow duplex 14 by 8 by 12 and a Worthington duplex 14 by 8 by 12, the auxiliary hoisting engines, the whistle signals at the hoist, machine shop, and for blowing smoke in both Le Roi and Josie mines.

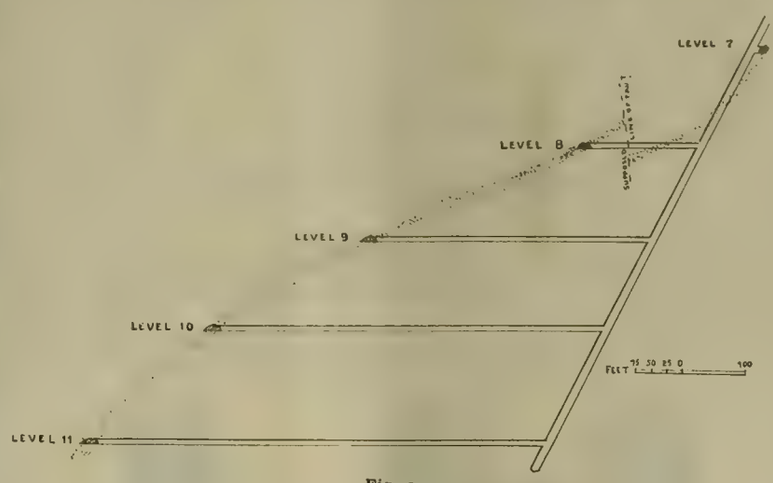


Fig. 5.

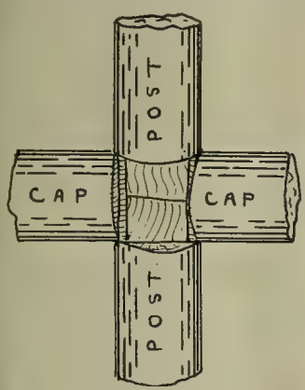


Fig. 4.

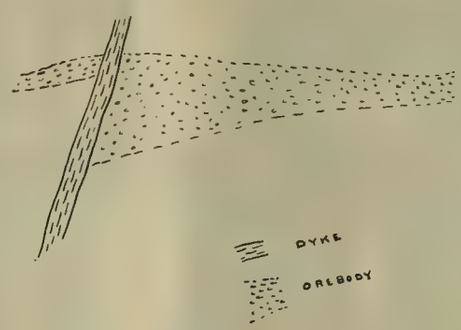


Fig. 2.

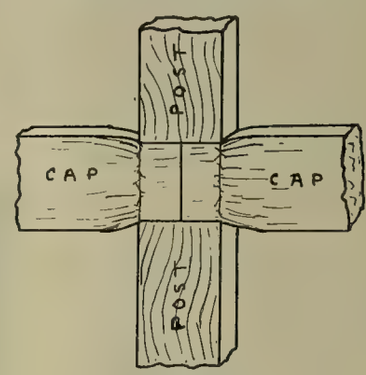


Fig. 3.

Fig. 1.

Twin-Beam Air-Pump.

The maximum efficiency of a condensing apparatus can only be obtained by observing certain laws and conditions. The injection of cooling water must be provided in a certain determinate quantity, depending upon the temperature of the water and amount of steam to be condensed. If the injection water is liable to be quite warm at times, the air-pump and condenser must be proportioned to suit the condition of highest temperature of the water, as, for instance, in tropical countries. If, for example, the water obtainable is liable to reach 80°, the quantity of injection water relative to the steam to be condensed will be as 55 to 1, assuming temperature of discharge from air-pump to be 100°, while, if the water is 60° only, one-half that quantity will do the work.

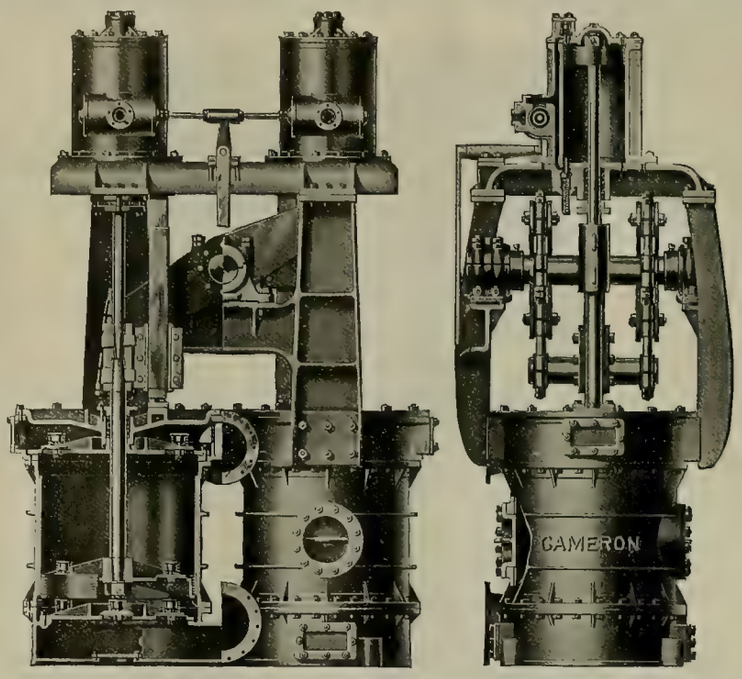
The size of condenser or condenser-volume is not an important factor, as when an ultimate association of steam and injection water is accomplished, that is the only thing to be considered. But in the jet-condenser system the size of air-pump is of the utmost importance. With the ordinary horizontal, direct-acting machine, the speed of piston should not exceed 70 ft. per min., and the pump should be so proportioned that the speed will be less, rather than greater. As the amount of air which will enter the condenser is an uncertain quantity in actual service, the exact size of the air-pump cannot be positively determined, but it should be amply large to provide for the contingencies likely to arise, due to leakage and imperfection, which permit of the admission of an undue amount of air from the atmosphere.

From the above it will be apparent that the size of condensing apparatus cannot be determined from the engine horsepower, unless it is known the number of pounds of steam per horsepower the engine uses. In other words, the size can only be determined from a knowledge of the pounds of steam of a certain pressure to be condensed. And no matter how the problem is presented, no accurate calculations can be made unless sufficient data are given to permit of its resolution into the weight of steam and its temperature. The temperature, however, is generally assumed, as under ordinary conditions the temperature of exhaust (which bears a fixed relation to its pressure) is very nearly the same.

We are indebted to J. J. Herrick, mechanical engineer of the New York dock department, for information pertaining to the relative size of engines and condensing system in use on each of the five new municipal ferry-boats, which are now in daily operation between Manhattan and Staten Island. The motive power and equipment of these boats are of the most modern design. They are propelled by twin steel screws, driven by two inverted, direct-acting, two cylinder, compound engines, having crank-shafts bolted together, and with steam cylinders 22½ in. and 50 in. diam. by 30-in. stroke, and develop over 4,100 h p. at 157 r. p. m., but in regular service only 3,000 h.p. is developed.

The main surface condenser, which takes care of the exhaust steam of these engines and auxiliaries, contains 1,884 tubes ¾-in. outside diam. by 12 ft. 4½ in. long, having a condensing surface of 4,513 sq. ft. The vacuum gauges show ordinarily 26 in., but sometimes 27 in. The centrifugal circulating pump has 12-in. suction and discharge, and is driven by a 9 by 9-in. vertical engine, making 160 r. p. m. The approximate amount of steam condensed by the engines per hour is about 18½ lb. per horsepower, thus, as stated before, for the present service 3,000 h.p. is developed, making steam consumption about 55,000 lb. per hour.

The Cameron vertical twin-beam air-pumps installed on these boats are used to pump the condensed exhausted steam from the main condensers, and deliver it to the feed-water tank or overboard; being of ample size, with 10-in. steam cylinders and 22-in. air cylinders, with 18-in. stroke. The illustration shows plainly the construction of these pumps, both the steam cylinders and vacuum cylinders being shown in section.



Sectional View of the Cameron Twin-Beam Air-Pump.

A RECENTLY printed description of a new instrument for surveying deep bore-holes contains a compass, plummet, cameras, and electric light, the whole connected with a small adjustable clock, so that the light may be turned on for a given period after the apparatus has been lowered into the hole. It has been used in surveying a number of holes in South Africa and has proved satisfactory. Both dip and deviation are recorded by means of photographs of the positions of both a plumb-bob and a magnetic needle at any desired point in the bore-hole. The photographs are taken by means of two small electric lamps lighted by a time contact.

The Prospector.

Enquiries sent to this department are answered free of charge, submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The white rock marked Goldfield Special is rhyolite.

The ore from Organ, New Mexico, is magnetic iron oxide (magnetite).

The rock from Tombstone, Ariz., marked A. G., is limestone, partly crystallized.

The samples from Raymond, Cal., are: No. 1, ilmenite (titanic iron) in quartz; No. 2, a silicious mica-tourmaline schist.

The white earthy sample from Dayton, Nev., marked C. T., is diatomaceous earth. The diatoms are very minute, and there are but few well-defined forms.

The rocks from Capitola, Cal., are: No. 1, largely composed of calcium magnesium pyroxene, diopside; No. 2, principally quartz. The dark mineral contains no zinc.

The rock from Steins Pass, New Mexico, is a feldspathic dike rock. It shows no metallic mineral, but is as likely to be associated with ores as any other eruptive rock.

The samples from Poker Flat, Table Rock, Cal., is a much altered dike rock containing pyrite and mispickel (arsenical iron sulphide). It probably also contains gold.

The samples from Telluride, Colo., marked J. L. F. are: No. 1, not shale, but a much altered feldspathic rock stained with iron and manganese oxides; No. 2 is what may be termed an iron alum, that is iron sulphate with small amount of aluminum.

The rocks from Iron Springs, Idaho, marked C. S. M., are all decomposed and iron-stained dike rock, excepting E, which is chert with some iron sulphide. This rock E is probably a silicified portion of the feldspathic material of which the other rocks are composed. 'E' should be assayed for gold and silver.

All the rocks from Joy, Utah, marked R. W. (excepting No. 2) are silicified feldspathic dike rocks stained by iron oxide. No. 2B is essentially quartzite, being composed wholly of grains of quartz. There are no indications of copper in any of these rocks, nor that they are from a gossan covering a copper deposit. There is a greater probability of their containing gold.

The samples from Aguascalientes, Mexico, are No. 1, quartz with iron sulphide. The blue mineral is only an incrusting film and has most of the physical properties of talc. No. 2 is quartz and chert with the sulphides of iron, zinc and lead. The galena is easily recognized by its cubic cleavage; the pyrite by its color, and the zinc blende by its brown streak; and its evolving sulphureted hydrogen on application of a drop of hydrochloric acid.

A Curious Accident.

Our Australian contemporary, the *Bendigonian*, gives an interesting account of a sensational accident at Mr. George Lansell's Needle mine, at Bendigo. We quote:

The driver, Thomas Woolcock, was engaged on the afternoon shift bailing water. A few minutes before 6 o'clock he was raising a tank of water in the western compartment. When the tank was nearing the surface, Woolcock applied the steering gear wheel to shut off steam. Although the wheel turned, the spindle did not have the necessary effect on the valve. The engine continued to work, and the tank was now perilously near the surface. The driver persisted in his efforts to shut off steam by turning the wheel tighter and tighter, but to no avail. He then realized that there was something wrong with either the valve or the spindle. Just then the tank ran up to the wheels, and the rope was severed by the thimble. Fortunately the patent safety grippers on the tank acted, and the tank remained suspended immediately under the bar in which the thimble is placed. All this time the engine was working under full steam. When the rope was severed, it flew off at a terrific rate. The protecting iron railings around the wheels were torn down, and the rope entering the engine-house made a large aperture in the corrugated iron. A rafter situated immediately over the drum was smashed. The drum kept revolving, and the rope coiling and recoiling, was striking the floor behind the drum and to the right of the driver with great force. In a few seconds a large hole was beaten in the floor, and the pipe immediately above it carrying the steam from the boiler to the engine was also repeatedly struck by the loose rope. Had that pipe been broken, a serious explosion would undoubtedly have occurred. In the meantime the tank in the eastern compartment had gone down into the cistern a little below 1,300 ft. Woolcock, when he saw the rope severed, had the presence of mind to run out of the engine-house and turn off the steam by the valve over the boilers. However, as the boilers are situated some distance from the engine-house, this operation took some little time. With the steam shut off, of course, the machinery stopped, and not too soon, for the tank in the eastern compartment was again ascending. If unchecked by the shutting off of steam it, too, would have gone to the wheels. The manager arrived, and an inspection was made of the machinery.

It was found that the pin and nut on the valve spindle had come off. This prevented the driver shutting off steam. The nut was some time later found in the piston-box, with the threads considerably worn. No blame was attached to the driver for the occurrence. The management considers him to be a very competent man. This was borne out by the cool and effectual way in which he acted subsequent to the breaking of the rope at the wheels. There were men engaged in the shaft sinking, but with the presence of the cistern there was practically no danger. No damage was sustained to the engine, the only requirement being the replacement on the spindle of a new nut and pin. Repairs were effected, and subsequently the men were hauled up from below. The loose rope on and about the western drum was straightened out, and a few shillings should cover the damages.

UNDERGROUND WATER.—The highest recorded velocity of underground water has been discovered by H. C. Wolff, of the department of mathematics of the University of Wisconsin, in the course of an investigation which he carried on in Arizona recently. The rate of movement of underground water in gravels near Tucson he found to be 144 ft. in 24 hrs., while the highest previously rated by observers was only about 100 feet.

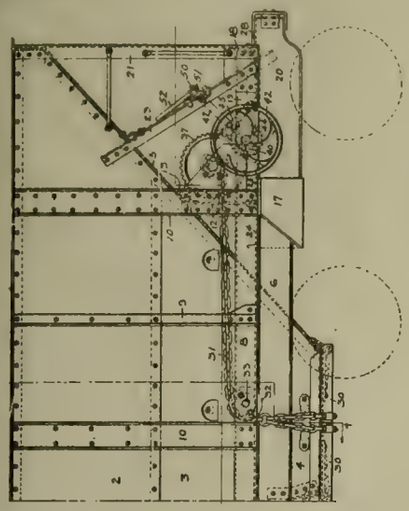
THORITE, a thorium mineral, occurs in square prisms, but also massive and compact; is brittle, of distinct cleavage, conchoidal fracture, of vitreous to resinous lustre, and has a hardness verging between 4.5 and 5, and a specific gravity of 4.4 to 4.8. A nearly related mineral is orangite. The color of the two minerals is sometimes orange or brownish-yellow (orangite), but sometimes brown inclining to black (thorite). The streak is light orange to dark brown, and the splinters, when thin, are nearly opaque. Thorite is known to occur in several localities in Norway. Thorium dioxide, when heated before the blowpipe, remains infusible; it imparts no tinge to the flame, and gives a colorless borax bead. It yields no characteristic reaction with cobalt nitre. The minerals containing thorium have become commercially valuable, as they serve for the preparation of the mantles of Welsbach's incandescent lights.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 13, 1906.

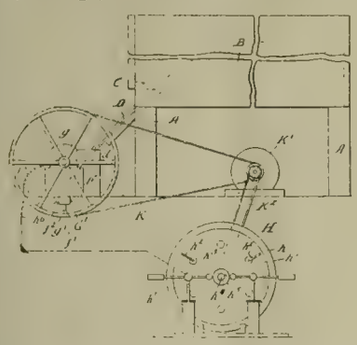
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ORE-CAR.—No. 814,273; A. Christianson, Butler, Pennsylvania.



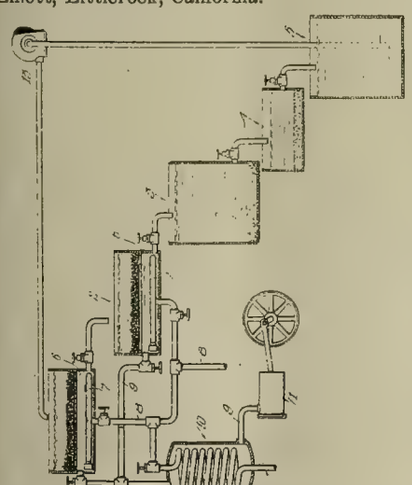
In a railway car, combination of longitudinal sills, body-bolster having vertical web projecting above sills, an end sill connected at its ends to car sides, draft-beams connecting end sill and body-bolster, and gusset-plate resting on draft-beams and secured thereto and being provided at its ends with flanges secured to web of body-bolster and to end sill, gusset-plate being triangular and having its wider end toward body-bolster.

AMALGAMATING PROCESS.—No. 814,814; H. A. Thomas, Chicago, Illinois.



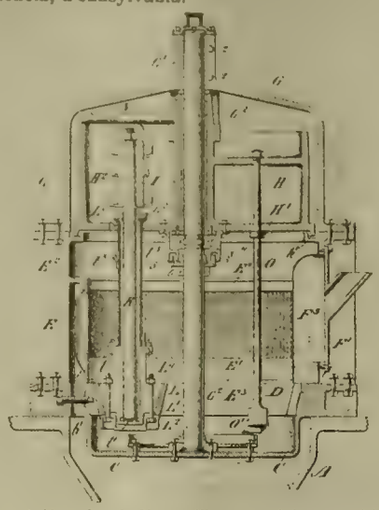
The dry amalgamating process herein described consisting in insulating a body of liquid mercury, charging it electrostatically, and feeding through it a thin sheet of pulverized ore, whereby precious metals are amalgamated or removed from ore and mercury completely freed and separated from tailings.

PROCESS OF COPPER SEPARATION.—No. 814,836; A. Elliott, Littlerock, California.



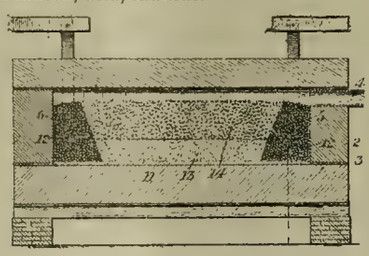
Process of separating copper from oxidized ores which consists in leaching ore with hot, non-acid solution of ferrous sulphate, passing air through solution during operation of leaching, separating solution from residue, and precipitating copper from solution by means of iron, thereby regenerating ferrous sulphate for repetition of process.

PULVERIZING MILL.—No. 814,961; E. H. Hurry, Bethlehem, Pennsylvania.



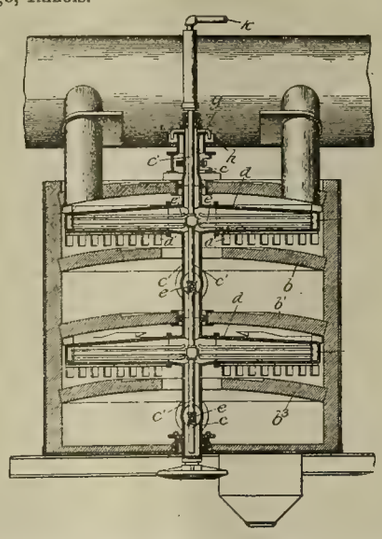
A centrifugal grinding mill, comprising combination of horizontally arranged grinding ring having an upwardly and outwardly flaring grinding face, downwardly extending roll shaft, driver above ring with which roll shaft is connected, and roll with downwardly tapering periphery, connected with roll shaft and traveling around ring.

ELECTRICAL SMELTING PROCESS. — No. 814,050; W. M. Johnson, Iola, Kansas.



The smelting process, which consists in interposing between charge containing low-grade ore, and furnace-wall, charge containing high-grade ore, thereby protecting wall from the action of low-grade ore.

ROASTING-FURNACE.—No. 814,238; T. F. Sheridan, Chicago, Illinois.

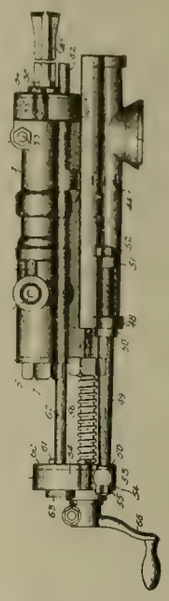


A roasting-furnace, hollow upright shaft, horizontally arranged hollow rake-arms attached thereto and communicating with interior thereof, supply-pipe in the shaft, branch pipes in hollow arms communicating with supply-pipe, branch pipes having terminal openings within the hollow shaft.

EXTRACTION VESSEL.—No. 814,940; C. M. Chamberlain, Lead, South Dakota.

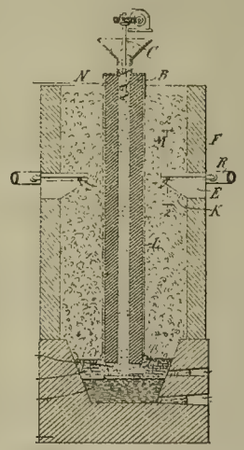
An extraction-tank comprising substantially air-tight vessel, tray mounted therein, filter-bed in tray, conduits communicating with tray above and below bed and discharge-gate extending across vessel opposite tray.

ROCK-DRILL.—No. 815,299; J. G. Leyner, Denver, Colorado.



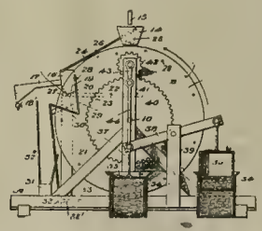
In rock-drilling engine, cylinder, supporting-shell in which cylinder is mounted, piston-hammer reciprocally mounted in cylinder, drill-bit loosely supported in cylinder, in the reciprocal path of piston-hammer, polygonal surface on drill-bit, gear loosely mounted on drill-bit and rotatably journaled in cylinder, gear in mesh with drill-bit gear, rod slidably keyed to gear, a feed-screw operatively connected to cylinder and shell, and means including gearing connected to feed-screw and rod for simultaneously rotating rod and feed-screw.

PROCESS OF SMELTING IRON ORE. — No. 815,016; P. L. T. Heroult, La Praz, France.



In the smelting of iron ore, process which consists in feeding ore, introducing carbon at base of charge while protecting it from action of carbon dioxide generated by smelting operation, whereby mixture of carbon monoxide and carbon dioxide is formed of gradually increasing richness in carbon dioxide as gases rise to point at which reduction of ore substantially ceases, and introducing oxygen at such point to further oxidize carbon monoxide and increase heating effect in furnace.

SAND AND SLIME SEPARATOR.—No. 815,095; D. J. Kelly, Salt Lake City, Utah.



In sand and slime separator combination with pulp-supply, of revolubly mounted wheel having side-delivery settling-compartments into which pulp is successively delivered, means for holding the wheel against movement, means for automatically releasing wheel, and means for imparting to wheel a step-by-step movement.

Special Correspondence.

LONDON, March 14.

At the third ordinary general meeting of Violet Consolidated, Ltd., held in London last week, the chairman described the progress made with regard to the extensive programme of development laid down at the previous annual meeting. The property of the company consists of 683 claims, two stands, 17 bewaasplaatzen (depositing sites) and two water-rights. There are 60 stamps, with cyanide works. Of the nominal capital—£500,000—there has been issued and paid up £396,762. The identity of the Botha reef with the Main reef has been established by an exhaustive geological survey of the property. With the help of 500 Chinese laborers who arrived in August last, active work has proceeded on the company's property in conjunction with the two neighboring mines—the West Rand Mines, Ltd., on the north, and the West Rand Consolidated Mines, Ltd., on the southwest, comprising together an area of 2.000 claims. The Botha reef, dipping south from the West Rand mines, extends into the Violet ground at a depth, proved by a borehole, of less than 1,900 ft. The Battery reef, outcropping throughout the property, with a strike northeast and southwest, has in the past been opened up to a considerable extent, and its great width will render it capable of being mined under the most favorable and economic conditions. Since the arrival of the coolies, the two shafts existing on the Violet property have been unwatered and they are to be connected by a long underground drift, thus opening up a considerable quantity of reef. The chairman said the company possessed ample funds to carry the work to a stage which would enable a better judgment to be formed as to the value of the reefs, provided the Government's present policy did not interrupt the supply of unskilled labor and render abortive the work already carried out. As a proof of the facility formerly enjoyed by holders of Rand mines for putting up prices, the £1 shares of this company, although with only a partially developed and non-producing mine, were dealt in at £3⅜ in 1904. They have since suffered in the general collapse, and now stand at £1½.

A cablegram from the East Rand Proprietary states that the Angelo Gold Mines, Ltd., had started crushing with their own mill of 40 stamps, which would be increased during the present month to 110 stamps.

The arrival in London is reported of a 21-oz. gold nugget, found about 15 miles southeast of Bulawayo, 62 ft. from surface—believed to be the largest yet unearthed in Rhodesia.

Under the auspices of Japan, it is thought the mineral resources of Korea, which are believed to be important, will be available for development and exploitation. There is a rumor that Messrs. Wernher-Beit are interested in a concession valued at £3,000,000 sterling.

British exports for February again show an expansion in iron and steel and "manufactures thereof," the values in this department at £2,912,000 being £754,222 higher than a year ago and £846,268 higher than two years ago. Our pig iron exports last month were 81,083 tons comparing with 56,508 and 47,184 tons, respectively, in the corresponding months of the two previous years, a fact which indicates that in Germany, the United States, France and Italy, in particular, the manufacturers' demand has progressed even more than in this country. The exports of machinery, at £1,890,911, are also £419,445 higher than a year ago.

According to the annual report of the Egyptian Mines Exploration Co., Ltd., some of the properties in which the company is interested are promising well. At Atallah a linear extent of at least 1,000 ft. of vein has been proved on its dip, down to 410 ft. The veins reach a maximum width of 47 in. and a maximum value of 10 oz. 2 dwt. per ton. At Eridia a large amount of work has been done and Mr. Alford reports the vein width as good throughout with a maximum value of 3 oz. 12 dwt. per ton. At Semna the company has by far the largest masses of goldbearing quartz yet met with. Crushing commenced on the Um Rus mine in March 1905 and the total for the year is 6,161 tons, the average yield being 17.24 dwt., allowing for 3.30 dwt. in the tailing. In this case the maximum value is not stated.

The Nile Valley Co., Ltd., has now carried through its scheme of reconstruction by including the provisions of Section 161 of the Companies (Winding up) Act 1862, under which, in the case of dissentient shareholders, if the arbitrator gives more than the price the shares realize in the market, the new company must pay the difference.

The Indian Glenrock (Wynaad), Ltd., is a remarkable example of perseverance in the domain of company finance. It is the result of a perfect maze of re-constructions, extending over a period of 20 years or more. The company possesses interests in Western Australia and New Zealand, but operations are now being centered on the property in the Wynaad district. After the expenditure of much money on low-grade propositions that were unprofitable, some rich specimens have been unearthed in shallow workings opened by the natives in former times. These rich finds are described as coming from outside the walls of an enormous reef worth by itself about 7 dwt. per ton. Cables concerning the discoveries have begun to raise the hopes of patient shareholders. The latest news is to the effect that rich ore has been struck in Kurrumber No. 3 and that samples from the whole width of the lode—three feet—pan 10 oz. per ton!

The Burma Development Syndicate, Ltd., was formed in 1903; with a capital of only £5,000 it secured three square miles of tinbearing land, 15 sq. miles of other mineral ground and nearly 1,000 acres of ground suitable for rubber planting. A remarkable account of the company's explorations was given at a meeting recently held to receive the agent's report. He stated that the property appeared to be one of the most extraordinary combinations of lode and alluvial tin that has been discovered in any part of the tin-producing East Indies, with natural facilities such as water-power, timber and a good climate to assure cheap production. Reports from various experts including Mr. T. W. Hughes, superintendent of the Geological Survey of India, go to prove that there is a bonanza in sight. The discoveries made by the Syndicate confirm the experts' opinion that the granite zone at Maliwan is extensive and rich in tin. Samples taken from the outcrop of a body of ore enable the agent to estimate that 10% tin oxide may be expected, which should yield 60% metallic tin. He also finds, in prospecting the alluvial ground, that the tin-bearing gravel runs from 18 in. to three feet in thickness under an over-lay of loam from three to six feet thick, and that the gravel contains more than 50 lb. tin oxide per cu. yd. It is proposed to form a company to work the properties of the Syndicate with a capital of £150,000, of which £75,000 is to be working capital. The lode-tin alone is estimated to yield about 22% on the capital, apart from the alluvial tin and rubber plantation.

A descriptive article in the *Times* contains some particulars of the Cerro Muriano copper mines, situated about 18 km. northeast of Cordoba, in Spain. The area of the 314 claims is about 776 acres. Here the Romans had a mining camp, which, judging from the extent of the remains, must have been of vast size. The shafts still left are some 700 ft. in depth. As for the modern workings, these consist principally of two main shafts, the object of the company being to continue the sinking of one of them—San Rafael shaft—to open up the lode and prove its value below the old workings. Mr. William Frechville, chairman of the company, in a recent report, stated that the material taken out whilst driving the 212 and 250-m. levels yielded, with the primitive dressing appliances available, at the rate of two tons of 18% copper ore per square fathom. He said the conditions generally were favorable for cheap work, and on a scale of 100 to 200 tons per day, an ore of about 2½% copper would pay. According to the latest reports, the mine is opening up well at different points. At the 820-ft. level west from San Rafael shaft, the whole face is lode-matter for the full width carried—six feet—with an average estimated value of 4½% copper. Other workings from this shaft and from the Victoria shaft are yielding similar results. The nominal capital of Cerro Muriano Mines, Ltd., is £235,000 in £1 shares, of which £85,000 is purchase price; Messrs. John Taylor & Sons are the managers.

A decision has been wrung from the Inland Revenue authorities in the case of Esperanza, Ltd. (Mexico), which has an important bearing on the assessment for income tax on profits of English companies holding shares in American mining companies. The Inland Revenue claimed the tax on the whole of the profits realized by Esperanza, Ltd., from dividends on its shares in the American (Esperanza Mining) company. Against this claim it was contended that Esperanza, Ltd., should be free from liability to pay income tax upon such profits of Esperanza Mining Company as are not remitted to the United Kingdom, in virtue of the English company being an investing or merely shareholding company, not carrying on or managing the business of the American company. This argument has been allowed to hold good and consequently the American shareholders (who own the bulk of the shares) of Esperanza, Ltd., will not suffer the annoyance and loss in having their portion of the profits mulcted for English income tax. To maintain this position, English and American companies so situated must take care to keep each company's accounts quite distinct and apart, and the English company's board and officials have to conduct their business and correspondence so as to show that they do not exercise any power of control over the American company or its officials and property; in effect, the management must be in America and not in England.

A thrilling account has just reached London of a Mexican bullion hold-up, rivaling in romantic incidents a story from the pen of James Fenimore Cooper. The author of the narration is Mr. John B. Farish and the bullion convoy was from Dolores mine. The attack took place about noon of February 15, at a point west of the Pajarito pass, some three or four hours' ride from Santo Tomas, on the Chihuahua Pacific Railroad, below a camp which the robbers had established on the mountain above, with the object of watching the movements of the bullion convoy from the mines. From this camp the approach of the escort could be observed for a considerable distance; and below it, on either side of the trail, breastworks of stone had been erected, partially concealed by branches, behind which the bandits were stationed. These breastworks, of which there were three, commanded a slope up which the convoy was compelled to move slowly; and it was evidently the intention to place them in such a manner that the space from the first to the last would include the entire bullion train in its usual marching order. The convoy entered the trap as calculated by the robbers, and when conductor Smith, riding at the head of the column, came abreast of the last barricade, which was very close to the trail, a man with his face partially masked suddenly showed himself behind the wall, and fired at him from a distance of about eight feet. The ball struck a cartridge in Smith's belt, cutting a piece out of the head and throwing out the primer, unexploded; and after passing through his belt and clothing it cut a deep gash about four inches along across the abdomen. Although his horse reared and bolted, Smith managed to draw his revolver and fire at the robber as he passed; but whether his shot took effect is not known. Meanwhile the other bandits had opened fire on the escort, two of whom were killed and one shot through the body, probably at the first discharge, while the last three fled for safety and gained a low ridge, which shielded them from flying bullets. Smith's best man, Francisco Torres, was probably not hit at first, as he was seen to jump from his horse and take to the thick brush for cover, with the intention of making a slight detour and reaching his chief, who was ahead; he died fighting, for his body was found a short distance from the trail, his rifle clutched in a death grip and the attitude of the body showing that he was hit while taking aim. As soon as Smith was able to restrain his frightened animal, he dismounted and ran back to the shooting, his intention being to cut out of the bunch the mule carrying the money, which he succeeded in doing after exchanging shots with one of the robbers who came out to meet him somewhat above the trail. Having secured this mule and finding that none of his men appeared to aid him, he struck out with the mule and his horse, and, after proceeding a short distance, cut the pack from the mule, took out the money and started on a gallop for the town of Cocomorachic, which he reached in about three hours, faint and weak from loss of blood. Tracks near the trail show that one of the bandits must have followed him closely on foot until he was beyond reach, it probably being expected that he was so badly wounded that he would fall within a short distance. Closely following the bullion train, and endeavoring to reach it in order to travel more safely, came a widow *en route* to her ranch on the Rio Verde, with her six-year-old daughter, and a single *mozo* as escort. Her party reached the spot at the very moment when the firing began, and she jumped from her horse, caught up her child and ran for safety. Her *mozo* was shot through the hand while endeavoring to draw his revolver, and joined her in a cave in the ravine below, where they remained hidden all that afternoon and the following night, until they were found by the searchers. The convoy men who escaped having reached Santo Tomas, a posse was formed, telegrams sent to the authorities for aid, and a start made for the scene of the attack, which was reached at four o'clock in the morning. Here another posse was found, from Cocomorachic, which had set out on learning from Smith what had happened. Part of the men pushed on to Cocomorachic after daylight to find Smith, who was reported in a dying condition, and the remainder started to follow the trail of the robbers and gather up the freight dropped by the convoy. Smith was found to be resting comfortably, however, and was left at Cocomorachic until brought into Temosachic by a Green Gold-Silver coach, when he received proper medical attention. The posse returning from Cocomorachic was joined by a force of *rurales* and the next day the trail was taken up and followed until lost at Tejolocachi, on the Chihuahua & Pacific Railway. It was regained shortly after, however, and as the authorities displayed great energy and willingness, strong hopes are entertained that the bandits will be caught soon. This tragic occurrence and the awful explosion in the French collieries at Courrières, near Lille, on Saturday last, involving the loss of over a thousand lives, are reminders that the mining industry has its martyrs and heroes equally with religion and war.

BUTTE, MONT., March 27.

Heinze's La France Copper Co. has taken up the option on the Lexington group, at Walkerville, Butte district. The group consists of the Louise, Angelo, Lexington, Wild Pat, Wappelo, Atlantic and Allie Brown claims and the Allie Brown millsite. There are less than 23 acres in the group. In years gone-by these mines were heavy producers of silver, but when the silver ore was practically worked out the mines were shut down by the French owners, without further exploration and development. Two years ago F. A. Heinze, who had developed his Corra mine up to the end lines of the Lexington, demonstrated that there was a copper vein running through the Lexington at considerable depth below the old silver workings, and through an agent in New York secured an option on the properties at a comparatively small figure. He subsequently organized La France Co. to take over the Lexington and Basin Reduction Co., which has now been done. It is surmised that La France will eventually become an asset of the United Copper Co., which has been left without property since the sale to the Butte Coalition.

The biggest new mining enterprise in the Butte district, in point of holdings and prospects, is the Butte & Bacorn Copper Mining Co., organized by Butte and Pittsburg capitalists. The company is a close corporation and the public is not asked to participate in its chances. Fred W. Bacorn, a Butte mining man, and 40 Pittsburg capitalists, including bankers, steel men and coal and iron men of that city, are the company's backers. The Pittsburg men have put up $10,000 each as working capital, and the company has purchased mines and locations to the amount of 245 acres, and has options on 225 acres more lying just north of Walkerville, at the extreme northern limit of the old Butte district. The ground owned and under option is nearly half a mile in width and about two miles in length, east and west, along a copper lode 150 ft. wide. There has been practically no development on the lode, but mining men, including a number of Amalgamated engineers and officials, are favorably impressed with the indications and prospects. The Butte & Bacorn has just started three shafts at different points on the property and is placing hoisting plants, air compressors and other necessary and modern machinery. One shaft has reached a depth of 80 ft. and is in good copper showings. The two other shafts are down about 65 feet.

The Cable Consolidated Mining Co., another corporation organized by Mr. Bacorn and his Pittsburg associates, is a holding company for the Cable Lease Co. and Cable Mining Co. The last named was the owner of the Cable gold mines, 50 miles west of Butte, which produced $4,000,000 in gold from workings near the surface. The Cable Lease Co. has been working the mines for several years, taking out a large amount of gold. Last week it shipped one bar worth $35,000. The mill is running 16 hours daily on good ore, and the company has 600 tons of ore ready for hoisting.

The Butte & London Co., now controlled by the Venture Corporation of London, is making rapid progress in sinking a shaft on the Greendale, going down at the rate of five feet daily and having reached a total depth of 200 ft. The directors of the Butte & London held a meeting in Butte a few days ago and confirmed the action of the stockholders in selling control to the Venture Corporation. Three new directors were elected to represent the Venture. They are Frederick W. Baker, president of the Venture; John C. Montgomery, of New York, American representative of the Venture, and LeGrand Smith, a London banker. The Venture Corporation was authorized to appoint a register and transfer agent in New York. They have $50,000,000 invested in gold and silver properties in Colorado, Mexico, California and Australia. Its entry into the Butte field is its first investment in copper.

Some of the richest copper ore mined in the Butte district is coming from the mines of the East Butte

Copper Mining Co., which are worked by lessees. A vein of copper glance has been opened in the Simon and the same orebody was cut in the Lassan, east of the Simon. The ore hoisted runs from 60 to 70% copper. The vein averages in width from two to four feet. The Yankee Boy is also mining rich ore. The East Butte company is making good progress on its enlargement of the No. 1 shaft. When that shaft is completed the company will mine the ground below 300 ft. and the lessees will probably be permitted to continue operations on the upper levels. They are paying a royalty of 25%, which is more than the average net earnings of Butte mining companies. Only two companies in the district last year showed better earnings than 25% net. Copely Amory, of Boston, a director of the General Electric Co., has spent a week in Butte and familiarized himself with the East Butte properties. William A. Paine, one of the large stockholders of the company, will be here during the first week in April.

The Anaconda Co. is hoisting ore from the big vein recently opened at 2,400 ft. At that point the same vein that was cut on the 2,200, several months ago, has been opened, and drifting is in progress. Reports are that the vein on the 2,400 is not so large as on the 2,200, but richer. The drifting shows it to run from 8 to 20 ft. wide. A portion of it, from two to six feet wide, runs 40% copper, and the entire vein at the crosscut will average about 15%. The Anaconda is now hoisting between 1,100 and 1,200 tons of ore daily, of which 250 tons are first class, averaging better than 20%. The general average value of the ore of the Anaconda Co. is between four and five per cent.

The Raven Mining Co. is making regular shipments of 50 tons of ore daily running from 5 to 7% copper. The rich body of ore found in the south vein, opened by a crosscut from the north vein drift on the 1,200, is continuous throughout a drift 250 ft. long east and west. The orebody is from two to six feet wide. The same vein has been cut on the 1,500 level and drifts there are in ore, indications in the east drift being that the same body worked on the 1,200 level will be soon encountered. The company is not stoping at present, the ore taken out being that mined in drifting and blocking. The north vein on the 1,500 level will be reached by the crosscut within a week, and then the output will be increased without stoping. On the 1,200 a number of raises on the north vein are in good ore.

SALT LAKE CITY, March 27.

March will close on a dividend record for Utah mines to the amount of $286,500, to which the Silver King contributed $100,000; Daly-West, $108,000; Consolidated Mercur, $25,000; Beck Tunnel Consolidated, $15,000; Grand Central, $12,500; Victoria, $10,000; Swansea, $5,000; Uncle Sam Consolidated, $5,000; Sacramento, $5,000, and Utah (Fish Springs), $1,000. The United States Smelting, Refining & Mining Co. has posted a dividend of 87½c. for payment in April.

The ore shipments from Park City last week aggregated a total of 4,805,460 lb.; the Silver King sending out 2,000,460 lb.; Daly-West, 1,145,000 lb.; Daly-Judge, 880,000 lb.; ditto, zinc middling, 632,000 lb.; Kearns-Keith, 123,000 lb.; Jupiter, 25,000 pounds.

Ore is being received by the Garfield Smelting Co., which is constructing the new plant near the old Garfield Beach bathing resort. Bin capacity for 25,000 tons has been provided. These bins will be filled preparatory to blowing in the first unit, about June 1.

The past week has witnessed the completion of an important work at the Daly-Judge mine at Park City, when connection was made between the 1,400 and 1,500 levels in the western portion of the mine's workings, where the principal exploratory work has been conducted during the past two years. The primary purpose of this raise was ventilation, but ore was encountered the greater part of the distance, the width of the vein being several feet. On the 1,500 one shoot of high-grade ore was encountered which has been followed 170 ft. with its limits still undetermined. The width of the body has not been ascertained beyond the limits of the drift. A sampling of this orebody was undertaken by a Salt Lake engineer during the month; he reported the ore to run $40 to $45 per ton. The management expects to have the bonded indebtedness cleared up by July 1. The company, even at the present rate of production, will be in position to pay dividends long before the close of the present year.

There have been a number of damage suits filed against smelting companies operating in the Salt Lake valley. In the latest one Oscar J. and Abram J. Reese are plaintiffs who ask for $37,449, alleged damage to their farms and crops during the three past calendar years.

The Colorado Mining Co., with headquarters at Provo, has filed an amendment to its articles of incorporation, increasing the capital stock from $125,000 to $200,000.

Conditions continue to improve as the shaft at the Silver King Consolidated, at Park City, goes down. It is now at a depth of 1,100 ft.

The stormy weather of the past few weeks will delay the starting of the Century mill in Park Valley mining district. The management is unable, owing to bad roads, to get in a supply of fuel. The condition of the mine is reported as encouraging by the manager, P. W. Madsen, of Salt Lake City.

The annual report of the Horn Silver Mining Co. just issued for the year ending Dec. 31, 1905, shows that the Beaver county property of this company produced 3,464,007 lb. lead, 6,639 lb. copper, 6,035,553 lb. zinc, 104,231 oz. silver and 335 oz. gold. The total receipts from ore sales aggregated $173,267.51, the same coming from 4,733 tons of crude ore averaging $12.44 per ton, 8,445 tons of first-class zinc ore at $10.87 per ton, 1,349 tons lease ore at $13.97 per ton, 5 tons copper ore at $31.12 per ton and 258 tons concentrate at $13.88 per ton. The total cost of ore extraction was $62,745.31, or an average of $3.85 per ton. The concentration costs were $3,111.50, $2.13 per ton, and the basis of concentration was 5.2 tons into one. Dividends to the amount of $80,000 were paid and the year closed with $39,415.91 cash on hand, $10,000 in call loans and no liabilities.

The initial shipment of ore from the Little Bell mine, at Park City, will be marketed in a few days. Recent important developments have caused the stock to almost double in price in the local market, during the past week. The company is capitalized for 300,000 shares and the Daly-West Mining company owns one-fifth of it. The annual election of the shareholders resulted in the election of Solon Spiro, president; Sidney M. Bamberger, vice-president; Herman Bamberger, treasurer, and J. B. Bean, secretary, all of Salt Lake.

The shipments from the Tintic district last week amounted to only 178 carloads, owing to the bad condition of roads. The shippers and amount being: Bullion-Beck, 8 tons; Ajax, 4; Carisa, 4; Dragon Iron, 3; Eureka Hill, 12; Grand Central, 9; Brooklyn Con., 1; Beck Tunnel, 8; Centennial Eureka, 54; Eagle & Blue Bell, 9; Gemini, 17; Lower Mammoth, 4; Ridge & Valley, 5; South Swansea, 1; Uncle Sam, concentrate, 2; Uncle Sam, crude, 4; Victoria, 4; May Day, 5; Swansea, 4; Scranton, 2; Yankee Con., 3.

The annual meeting of shareholders of the Utah Consolidated Mining Company has been set for April 17, at the offices of the company in New York.

A shipment of lead ore from the Butler Liberal mine, of Bingham, marketed a few days ago, averaged 55 per cent lead.

A large body of copper ore has been cut in the Gold Hill property, in the Clifton district, Deep creek, in Tooele county, on the 100-ft. level. The assays are fair. A drift is being run from the 150-ft. level.

Negotiations are still pending between Peter Haack, of Los Angeles, and some of the larger shareholders of the Honerine, through which Mr. Haack hopes to get control of the mine. While it is not known positively whom he represents, the supposition is that the negotiations are in the interest of F. A. Heinze and associates. Mr. Haack has made overtures to the Black Diamond and New Stockton companies for a control of the mines owned at Stockton by those corporations.

The holders of the option on the City Rocks mine, at Alta, have made another payment on the purchase price, leaving still due, $100,000.

For a consideration of $2,250, the United States Ozokerite company has purchased 160 acres of ozokerite claims in Spanish Fork cañon, Utah county.

Power drills have been installed at the Montezuma property, at Bingham, and the working force has been increased. Peter Porter, of Salt Lake, is manager.

The total ore and bullion settlements reported at the close of last week by the banks of Salt Lake City aggregated $428,500.

The Michigan Copper Co., backed by Michigan capital, is operating in Beaver county. A shaft is down 200 ft. and will be continued to the 400 or 500-ft. level. Ore carrying low copper values has been encountered. J. M. Reynolds, of Salt Lake City, is manager.

DENVER, March 25.

For some time past an association of individuals has been acquiring property and preparing plans for the construction of a reservoir, to impound the waters of the St. Vrain. It is their intention to incorporate under the name of the Lake St. Vrain Co. Under the preliminary organization, considerable property has been acquired and plans have been matured, covering an undertaking of great magnitude. The reservoir site will cover the town of Lyons, Boulder county; the proposed dam is to be located about one mile east of the town, and if the present plans are carried out, the town, containing about 700 inhabitants, will have to be moved.

The plan and section maps of the dam show the following dimensions: The dam proper rests upon a foundation 200 ft. wide, extending 12 ft. below the ground-level, which level lies at an altitude of 5,300 ft. above sea level. The superstructure, commencing at the foundation, is 180 ft. wide and 250 ft. high at high-water mark, to which line it is battered to 20 ft. wide; above the high-water line there will be a parapet of 8 ft. base and 10 ft. high, making the total height of masonry 272 ft. or 260 ft. above the ground-level. The length on ground-level is 1,300 ft. and the extreme length at the top of the dam is a little more than 2,350 ft. The longitudinal sections shows a straight line with the ends of the dam carried 12 ft. into solid ground. The silicious red sandstone abounding in the vicinity will be used in the construction of the dam. The association has secured a large acreage of sandstone, including the Mathews red sandstone quarries at Noland, three miles distant from the dam and connected with it by railroad. A perfect block of sandstone from these quarries, 9 in. thick, 8 ft. wide and 25 ft. long, was laid in front of the main entrance of the Colorado building, at the Chicago World's Fair.

It is the intention of the company to establish a central power station at the dam and utilize the most approved machinery and methods in quarrying, transportation and construction. If the company meets with no hindrance to its plans, it will commence construction of the dam this summer. It is proposed to quarry and lay 1,000 cu. yd. of stone per day. The dam will cost between $2,000,000 and $3,000,000, and will require several years to complete. The storage capacity of the reservoir will be 8,000,000,000 cu. ft. of water, about double that of the new Croton reservoir of New York. Referring to page 44, 'Water Supply and Irrigation Paper No. 74,' Series 1, United States Geological Survey, 'Water Resources of Colorado,' A. L. Fellows, St. Vrain creek at Lyons, we find the data for 11 years—April to November of each year—giving the mean annual run of water at 10.7 in. from a drainage area of 209 square miles; equivalent to 1.18 second-feet per square mile. The St. Vrain, therefore, furnishes excess water, not used in irrigation, when stored for use, to cover about 400,000 acres with a sheet of water three inches deep, twice a year, which is sufficient justification for a project of even greater magnitude than that of the Lake St. Vrain Company.

Development work on the Maple Leaf mine, at Sillsville, Gunnison county, has been carried to a depth of 250 ft., and levels have been driven 80 ft. long from this depth, disclosing a lens of ore eight feet thick, said to carry 1½ oz. gold per ton. The mine has nearly 900 ft. of levels developing an ore-shoot 200 ft. long by 3 ft. wide, valued at from $6 to $12 gold per ton. The stamp-mill, of 35-ton capacity, is nearly completed and will commence to run on ore about May 1.

Mining Summary.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

Authorities in Seattle have issued a statement claiming the gold output for the present year in Alaska and the Yukon will amount to $32,000,000 in round numbers. Of this amount it is estimated that the Tanana section will lead with $14,000,000.

The London Perseverance Mining Co. according to W. H. Hampton, is planning the development of its quartz properties in the vicinity of Juneau. This mineral zone is two miles long and 200 ft. wide, the ore running from three to four dollars per ton. At present it is developed to a depth of 900 ft. by a tunnel, 2,500 ft. in length, but the company is planning a tunnel 10,000 ft. long, which will run through the mountain and make it possible to deliver ore at tidewater. Five companies will combine to drive this tunnel.

ARIZONA.

(Special Correspondence).—A number of the large lead-producing claims in the Huallapi mountains, in Mojave county, are to be worked this spring and summer. Arrangements have been perfected by a number of claim owners to handle these ores. A small milling plant will be put in at the Enterprise mine for custom work on low-grade ores. The higher grades of lead ore will be shipped.

The vein in the Climax mine, in Union Basin, will within a few days be cut. The drift will drain the mine of water. In the bottom of the shaft, which is 170 ft., there is a body of ore which is said to average $100 per ton.

Three hundred men are now employed at the Helvetia mine, in Pinal county. The smelter, which has just blown in, is making a trial run. It has been found necessary to make extensive repairs to improvements at the mine, as the plant has run down during the five years it has been idle. The ore-bins are badly warped and will have to be replaced by new ones. Fine ore is being taken out from the 800 level.

The Cyrus Noble Co., at Searchlight, Nev, has purchased from the Quartette Mining Co. its entire electrical equipment, which includes a 40-h.p. engine and a 30-kw. dynamo. The plant, when installed, may furnish lights to the town. The work of enlarging, timbering and improving the shaft is still in progress. The mill will be in operation soon.

The new hoisting plant at the Weedin mine, at Pittsburg, is in operation and doing good work. The shaft, which is one of the best in Pima county, has attained a depth of 310 ft. The bottom is in silicious lime rock, slightly impregnated with iron and copper sulphides. Water, to the amount of 100 gal. in 24 hours, has been encountered.

Phœnix, March 26.

Cochise County.

At Paradise, it is reported that a rich strike has been made one-half mile north of that town. The ore is telluride of gold and chloride of silver running into the thousands. The lucky prospector was Fred Bernoudy. The vein is three feet wide, and at a depth of 40 ft. an assay gave returns of 42½ oz. gold, 2,680 oz. silver and 30% lead. Men have been put to work and shipping of ore begins at once.

Mohave County.

At Stockton Hill the contractors drifting in the Banner mine have opened up a body of rich ore 3½ ft. wide, showing wire and massive native silver. Quite a number of tons of this ore were taken out, but owing to the fact that there is no ore house at the mine in which to store it work was stopped on the drift. About 100 ft. from the breast a raise is being made and stopes opened. As soon as the mill is in readiness the mixed ore will be concentrated and shipped.

Thomas Brayil, part owner of the Lucky Boy mine at Chloride, is getting out a carload of rich silver ore for shipment to the local smelter. A new strike was made on the 300 level owing to a cave which uncovered an ore shoot running $700 in silver and an ounce in gold per ton.

Yavapai County.

Five miles west of Prescott, and near Thumb Butte, H. C. Malloy recently sunk a shaft 30 ft. on a claim he purchased from J. W. Mullican, and is sacking the ore taken out for shipment to the Humboldt smelter. When Mr. Malloy's attention was called to some ores that Mr. Mullican had found on the property, he had an assay made which gave good results. He purchased the claim and staked three other claims on the same vein and commenced to sink in a 10-ft. hole. At the bottom of his shaft there is a solid body of sulphide ore 2½ ft. in thickness, which averages $75 per ton in copper, gold and silver.

Work which was temporarily suspended on the Pine Mountain group in the Walker district, has been resumed with W. J. Casey as foreman. —— The installation of machinery on the Mark Twain, near McCabe, is completed, and the management expects to have a large force at work in a few days.

The American Girl group of ten claims and millsite have been sold by L. I. Fletcher to T. N. Barnsdall, of Pittsburg. The group is situated east of the Agua Fria river, and two miles from the Humboldt smelter, in the vicinity of the Baumann Copper Company camp, in a locality traversed by a number of large iron and schist dikes, along ore deposits that have been exposed by surface workings carrying copper and gold.

Wm. Thiesing has sold his property to the New England Copper Co. Mr. Thiesing had developed the ground himself and has over 500 tons of shipping ore on the dump and 2,800 tons blocked out in one of the claims, the average value of which is $18 per ton in gold. In addition to this, there are 900 tons of tailing at the mill, which carry $9.30 per ton, which can be treated by the cyanide process. The properties included in the trans-

fer are divided by Turkey creek into two groups. The one on the west side, consisting of five claims, includes the gold mine, upon which the greatest amount of development has been done. The group on the east side, 12 full claims, has not been developed, but has a good surface showing in copper and gold. The Golden Belt claim, one of the west-side group, is opened to a depth of 300 ft. by a number of incline shafts and by more than 2,000 ft. of drifts and crosscuts. The deepest shaft on the east side group has only been sunk to a depth of 60 ft. The sale includes the mill on the ground, all the camp equipments, houses and other improvements.

CALIFORNIA.

Amador County.

The Galena mine, near Volcano, is working 14 men eight-hour shifts, under the management of John McCuch. Machine drills are employed, and the work of sinking is being continued. The Volcano mine is another property three miles from West Point. Sinking is going on and it is to be worked more extensively. A body of ore has been struck in the tunnel, and the 10 stamps of the mill are running. The mine employs 25 men under the management of C. J. Newman. The total rainfall in the district has been greater than in any year since 1902—to the present date, 33 inches.

Calaveras County.

Work has been resumed at the Deep Gulch mine, owned by F. W. Suessdorf, near Rich gulch. They are running both day and night shifts and the outlook for the future is good. A tunnel is in 150 ft. and a winze is being sunk where the north and south veins meet, 75 ft. from the surface. The ore assays $37 gold per ton.

Near Mokelumne Hill, the Easzy Bird mine employs 12 men, and they keep 10 stamps dropping on ore that plates $3.60 per ton, besides yielding a ton of sulphurets per day, which nets $50 per ton. The mine is worked through tunnels, the vein averaging 10 ft. wide of milling ore.

At the Nelson ranch, two miles from West Point, two men are working a ledge. Also at the extension of the Blue Bell mine, on the South Fork, two men are extracting ore. On the Middle Fork, at Moreheads, work is being prosecuted with good results. Geo. Cougdon is working the Yellow Aster, and George Chick and James Thompson have a good showing on the Middle Fork. T. Carlton is running his 5-stamp mill on rock taken from his mine on the South Middle Fork of the Mokelumne river.

El Dorado County.

It is reported at Greenwood that a 10-stamp mill is to be built on the Vivian mine, near that town. A vein six inches wide at the surface has widened in 60 ft. to 4 ft. wide.——A nugget worth $600 was found by John Hipp near Georgetown a few days since in digging around the roots of a dead tree.

Kern County.

Charles Taylor, superintendent at the tungsten mines, near Randsburg, says they are working 22 men and taking out high-grade ore. The railroad company has put in a spur and they load cars at the mine. Shipping to the Barstow mill has proved a success and they concentrate five cars of ore into one. The first week in April they expect to ship two cars of high-grade ore direct from the mines to Liverpool or to Germany. They now call the new camp and station Atolia. A new Fairbanks & Morse gasoline hoist has been ordered for the mine and is now on the way.——George and Harry Swartout and B. B. Summers are taking rich ore from the Minnehaha, and expect to have a milling soon. The Minnehaha lies just west of the Yellow Aster mines, and some of the richest ore ever taken out in the camp came from this mine.——Everything is going smoothly at the Yellow Aster mines and mills, where they are crushing 500 tons of ore and working 175 men. The ore is at present running well.——In drilling for water near the wells in Goler wash much difficulty has been experienced in going through the boulders which compose all the drift after getting a little below the surface, and the work is slow. They have one well down over 400 ft. and struck the water 30 ft. before reaching that point. They expect to continue at least another 100 ft. The new deep well east of Johannesburg has never been thoroughly tested, as it is a difficult job to pump that depth, but the company has nearly completed arrangements to test its capacity, which will be done inside of two weeks.

Nevada County.

Forty-five students of the mining college of the State University at Berkeley will go to Grass Valley April 10 to visit the mines of that district for a week or so. They will be accompanied by Professor Lawson, and while there will go underground every day.

The Champion Mines Co., of Nevada City, will start up 20 stamps of its mill. The recent strike in the Nevada City mine will furnish most of the rock for crushing, some of it coming from the Champion. A long drift has been run to reach the ore-shoot in the Nevada City, which was reached a few days ago. When the ore-body has been developed sufficiently, it is thought the entire mill equipment can be kept in continuous operation. The ore is far from the territory now in dispute between the Champion and New Home companies. The mine is making considerable water, but not more than can easily be controlled.

Plumas County.

Work on the Antlers mine, situated on Craycroft ridge, five miles from Downieville, says the *Messenger*, is progressing. The tunnel, which will cut the vein at a depth of 300 ft., is in 200 ft. and near the vein. The ledge is eight feet in width and assays from $3.50 to $6 per ton, free milling. The pay shoot is several hundred feet long and it prospects the entire distance. The mine consists of four locations and is owned by T. Winrod and J. E. Deal. The work is being done by T. E. Hayden, who has a bond on the property. The camp is one of the neatest and most conveniently equipped in the county.

Sierra County.

(Special Correspondence).—John Spellenburg, Samuel Devine and Frank Cook, of Sierra City, have sold the Bullion mine to Los Angeles and San Francisco parties. The company has incorporated, under the name of the Royal Quartz Mining Co., and they have let a contract for running a tunnel and drawn plans for a mill. The ledge is from 3½ to 12 ft. wide and mills from $7 to $12 per ton.

The Mountain mine has closed down temporarily, on account of shortage of timbers.

The Empire company, in Gold valley, has its electric plant repaired and is running 20 stamps.

The Gold Point mine is going to continue the main tunnel on the course of the vein.

Work at the Sovereign is progressing steadily.

The Tightner has installed a gasoline hoist and will resume sinking while they are driving the tunnel.

The Telegraph has bought a large Cornish pump and will resume sinking as soon as it is installed.

The Antlers owners expect to strike the ledge very soon in their crosscut tunnel.

Spaulding & Peckwith are taking out rich gravel. This is a continuation of the White Bear channel.

Downieville, March 26.

Work will be resumed at the Kelston mine and mill early in April. The main tunnel is in a mile, and the incline is 400 ft. from the face to the bottom of the old shaft through which the mine was worked years ago.

The Mountain mine, owing to the lack of timber, has been compelled to shut down.

Tuolumne County.

Last week the dam at Phœnix lake, three miles east of Sonora, broke. The wagon bridge on the Tuolumne-Sonora road and the railroad bridge were both washed away. Several mines of the vicinity were dependent on power from the lake.

Sixty men are working at the Soulsby mine at Soulsbyville.——At the Black Oak 80 men are employed.——At the Confidence the company is increasing its working force.——Over $4,000 was taken out of Dull & Co.'s Jackass Hill mining properties, near Tuttletown, last week. —— The work of unwatering the Louisiana mine, near Carters, is progressing.——At the Paymaster, work on the tunnel, under T. Knowles, is being pushed forward and many other improvements are being made.

The Grizzly mill, near Carters, is running steadily on rock from that mine and the New Albany.——At the Paymaster in Hunter cañon, work is being confined to the 400-ft. tunnel, the contract for which is held by George Bartlett and partners.

A few men were put to work in the Harvard mine at Whiskey Hill, near Jamestown, last week. Thomas Russell is foreman.

At the Lady Washington, near Carters, the new boarding-house is almost completed. A small crew of underground men is at work and others will be added when working room is made. The 1,700-ft. tunnel has to be driven 250 ft. farther to connect with the Dead Horse shaft, when the two mines will be operated together.

COLORADO.

Chaffee County.

The test recently made on the Independence ore by the electro-magnetic separators was satisfactory, with the exception that gold was not saved and all the copper was not saved, and, as the principal values are in copper and the gold values small, it is demonstrated that the ore can be handled profitably. Further tests will be made with a view to saving the gold as well as the copper, which will add about 90c. per ton to the available result.

The Jasper lessees have opened a streak of smelting ore at the heading of the drift in the 200-ft. level. A stope has been started. The streak is seven inches wide and widening.

In the Telma work continues in the drift on the Holdrege vein. In driving the tunnel a cross-vein was encountered beyond the Holdrege vein, which carries milling values in the tunnel, and when it is reached a large quantity of milling ore will probably be opened.

Custer County.

R. W. Eames and James Ryan have taken a bond and lease on the Monitor lode. The claim is said to show a streak of ore 12 in. wide, which assays 38 oz. silver per ton.

J. T. Stroehlke has leased a block of ground lying on the Bismuth, lying between the main Bismuth workings and the King of the Carbonates, and has begun work. He has an 18-in. streak of ore, samples running 53 oz. silver per ton. Phillips & Skevington have taken a lease on a portion of the Bismuth.——H. Cocking now has a force employed in putting up buildings on his copper property.——Dr. Pretson, who is operating the Bismuth mine, sent another car of ore to the smelter at Salida. ——Work on the Little Bernice is progressing. The drift at the 380-ft. level is in 50 ft., and it is expected to cut the ore found in the upper levels.

Gilpin County.

The Eureka mine, of J. C. Jenkins, one of the oldest patented properties in the county, but which has been idle for a number of years, is again in operation. Fifteen men are at work, mostly lessees. Work is confined to the 300, 400 and 500-ft. levels, where good bodies of ore are opened. On the 300 level smelting ore is being taken out that nets $80 for first class and $60 for second class. In drifting west on the 500-ft. level, a body of smelting lead ore has been opened up.——Wettstein, Fontaine & Co. have completed the erection of a whim on the Fagan claim of the Grand Army or Gunnell vein in Prosser gulch. The collar of the shaft has been raised and track put in to the ore bins. An increased force of miners is being put on, a night shift being again employed.

Gunnison County.

After lying idle for 12 years, the Denver City copper mine at Iris has been bought by J. M. McDougal of Gunnison. The last ore shipped from the property carried 17% copper. The old workings consist of a 200-ft. inclined shaft and 500 ft. of levels and crosscuts. A new shaft 50 ft. deep will be put down to reach the old one, and a new shaft-house built. On one crosscut alone there are three veins of copper ore, which measure one, six and ten feet, respectively. In another crosscut is a 19-ft. vein of zinc ore.

Dr. Louis Weiss reports his intention to erect a mill at his Vulcan mine as soon as the process for treating Good Hope ores is thoroughly tested. The Good Hope, Vulcan and Mammoth Chimney ought, when properly developed, to become some of the greatest producers in Colorado. The immense dumps have hundreds of thousands of dollars of values obtainable under modern mill conditions.

Lake County.

The Boston-Arizona mill, at the head of California gulch, is ready for operation, and ore from the Fanny Rawlins will be treated, making a high-grade zinc product and a lead-iron concentrate carrying the gold and silver. The mill will treat 20 tons daily, and if the experiment is a success the capacity may be increased to 200 tons daily. The lessees who were driven out by the fire at Mahala have resumed work. Before work was suspended 60 tons of zinc ore were being shipped daily.

San Juan County.

A few men have been employed on the Congress group in Bridal Veil basin, at the head of Blue Lake, for several months past. Work was suspended a week ago on account of the deep snows. Reese Breckenridge brought down 100 lb. ore from the property last week, which will run $700 per ton. The pay streak from which this ore was taken is a foot wide. The vein is from three to six feet wide between walls, and highly mineralized in gold, silver and lead. Besides the Congress there are three other claims in the group. P. Hanson, J. W. Hanson, P. A. Lilley and E. M. Arthur are the owners.

Summit County.

(Special Correspondence).—New incorporations are of frequent occurrence in the Breckenridge district. Besides the New Holmberg Co., organized a few days ago, are now three additional companies formed to operate here. The first is the Coyne Gold Mining Co., organized to work a group of mines on Peak 1, in the Ten Mile range. The Emma J. forms part of this group and 25 years ago was a prominent producer of silver-gold ore. This property was bought outright, patented, and the owners have allowed it to remain unworked until this new company was formed.

The Bay State Mining Co. is the title of an Eastern organization formed to work a group on the upper Blue, on the west side of the Senator mine. The local management is in the hands of Arthur Howard.

The Mons Auri Mining & Milling Co. has been formed by Mark G. Evans, of Denver, to operate a large consolidation of claims on Farcomb hill, in which is included the Wire Patch. Farcomb hill is the locality from which beautiful crystallized gold specimens have come, which have taken the first prize in numerous exhibitions, where shown, including Chicago in 1893, St. Louis in 1904 and Portland in 1905.

The main shaft of the Little Sallie Barber is now down over 100 ft. The owners expect to strike the extension of the zinc orebodies found in the adjoining property at a greater depth, estimated at 60 feet.

The Baird brothers, who are working a lease on the Dunkin mine, on Nigger Hill, have just made a 12-ton shipment of high-grade gold-silver-lead ore. They are doing a great deal of development and making ventilation connections. They expect to ship large quantities of ore the coming spring and summer.

The Reliance Dredging Co., on French creek, has carpenters and mechanics at work on their large boat, putting it in shape and renewing the worn parts of the machinery, preparatory to an early start at digging, which they hope to begin by April 1.

At Frisco, the Mary Verna main tunnel is now in 630 ft., has passed through the hard diorite and got into the softer porphyry zone. Progress is more rapid and the face is in proximity to the Copper Queen vein.

The North American tunnel is in 929 ft. and still going ahead. About 30 ft. back from the face a ledge of iron sulphide in quartz was cut, which is being drifted on.

Breckenridge, March 20.

(Special Correspondence).—Breckenridge, if all goes along as it is mapped out, is to be connected with the Moffat road by railway via Dillon and Kremenling. This project has been set on foot by local capitalists who have large mining interests here, and who have not only secured the right of way, but are backed by the necessary cash required to carry the scheme to a successful issue. The prime movers are Mr. John G. Goodier, general manager of the Abundance Mining & Milling Co., of Breckenridge; Mr. Chas. E. Oehler, a local attorney; Mr. Wm. F. Forman, County Clerk of Summit county, and Mr. Wm. Off, a Kansas City capitalist.

This new connection will bring a fair freight rate on ores and concentrate which are now being shipped at excessive rates over the C. & S. (when cars can be procured), and will also enable the bringing in of coal from Routt county at reasonable prices. The coal question in Breckenridge and surrounding points is a serious one, and while one road has the monopoly the citizens must either pay the present exorbitant prices demanded by the railway or go without.

The road will open up Montezuma and the Lower Blue camps, which are now off from railroad communication and reached by long wagon hauls. This will make both sections large and permanent producers.

Montezuma is doing good work for this time of year. Charles H. Campbell and H. N. Finotte, who are working the Fisherman mine under lease, have just opened up a high-grade lead-zinc ore streak two feet wide for 50 ft. in length. Two carloads have already been taken out, while drifting and more shipments will follow.

The Sarsfield mine has a shipment of six or seven carloads of lead-zinc ore awaiting transportation.

The Juno mine, worked by Mr. Rosengardner, has developed a solid zinc streak over two feet wide. This ore assays over 50% zinc.

The Waterloo mine has been taken over by a new company under the title of the Calumet Mining, Milling & Smelting Company.

Breckenridge, March 24.

Teller County.

The total tonnage from Stratton's Independence for

March will aggregate 3,000 tons, produced by sixty or more sets of lessees.

Lessees on block 13 of the Ajax, Mulvaney and associates, have opened a new shoot in the vein developed at the 280-ft. level of the mine. The coarse rock broken is running between three and four ounces gold per ton and the screenings 11 oz. per ton. In all there are 20 sets of lessees operating on as many different blocks of the Ajax and a majority of them are in ore.

A rich shipment of 30 tons of ore carefully sorted in three grades was sent out from the Gent and Mumm lease on block 6 of the Work company's Morning Glory claim on Raven hill last week. The ore ran: First grade, coarse rock, better than 10 oz. gold per ton; second grade, screenings, 5 oz. per ton, and third grade, or 'middlings,' 2 oz. gold per ton. The bulk of the shipment will be of the coarse rock, carrying the highest values.

Among the last week's shipments were the following: Smith & Altman, lessees on the Elizabeth Copper on Raven hill of the Doctor-Jack Pot Co., 3 cars; Morgan & Williams' lease, Cobb shaft of Moon Anchor Co., 1 car; Bruington and associates, lease on Old Gold, Beacon hill, 1 car; J. O. A. Carper lease on the Pinto, Free Coinage Co., 1 car; lessees on the Lucky Gus of the Stratton estate; Monte Cristo on Beacon hill, Hobbs & Co. lease, 2 cars; Gilpin Leasing Co. on the Jerry Johnson, 2 cars; Western Investment Co. lease on the Orpha May of the Stratton estate, 2 cars; Tunnel Mining & Leasing Co. on the Abe Lincoln in Poverty gulch, Stratton estate, car each day; Forest Queen, lease of Walsh and others, 1 car: Henry Adney on Beacon hill, Burke and associates operators, 2 cars; dump lessees on Mary McKinney, 1 car.

A three years' lease with graded royalties of from 15% to 25% has been granted to W. P. Layton, of Elkton, and A. P. Whitmore, of Cripple Creek, dated April 1, by the Bonnie Nell Co. The parties named have been contracting on the property since last October. They have been crosscutting at a depth of 170 ft. and have opened up a basalt dike which assays from $6 to $8 per ton. It is the intention of the lessees to construct a cyanide plant for the treatment of this ore.

Omaha capitalists, who recently secured a three years' lease on the Lost Lillie claim, on Copper mountain, from the Copper Mountain Gold Mining Co., will commence the sinking of a vertical shaft on that claim by April 1. A contract will be let for the first 100 ft., after which machinery will be installed and operations will be conducted by the leasing company. They also contemplate the construction of a new concentrating plant or possibly a cyanide mill at or near the shaft. The ore contains gold, silver, lead and zinc. This property, on which gold values in paying quantity were first found on Copper mountain, was classed as a shipper years ago, but has lain idle for a long period.

The Trilby, on Bull hill, is shipping heavily and the output for March is estimated at between 500 and 600 tons. The ore is of good grade and the Trilby company, it is believed, is rapidly taking the purchase price out of the mine.

IDAHO.

Idaho County.

The large and expensive mill at the Sunnyside mine, in Thunder Mountain district, which was expected to make a record in bullion production, demonstrated, after a brief run, that the ore had been greatly overestimated and the results produced are reported not to have been sufficient to pay operating costs. The mill was shut down and a new manager carried a small force on development, which was increased until a crew of 40 men is employed at present on exploring and development, with a view of discovering and blocking out pay-ore. This work is in the hands of Captain Trewick. Recent reports say that ore has been found that runs from $3 to $50 per ton.

The Dewey mine, of the Thunder Mountain Gold & Silver Mining Co., continues to be the only gold producer in the district after four years of steady development. This property made a fine production during 1905, considering the fact that its mill was closed down several months undergoing repairs. The production for the past year aggregated $67,000, and the mine and mill continue in successful operation. Part of the year's run was made from a surface quarry which yielded $7 ore that was mined and milled at a total cost of $2.20 per ton.

Owyhee County.

A rich discovery is reported on Sinker creek, 13 miles from Murphy, on the Silver City stage road. In the early days thousands of dollars were placer mined from the little gulch extending a mile in a northwesterly direction from Paul's station. Many unsuccessful efforts were made to find the ledge or ledges supplying this gold until last fall, when E. T. Clark, noticing the gravel piles along the bottom of the gulch, began an investigation, with the result that he found a seam not thicker than one inch on the surface to be the source of the deposit. He has now opened the ledge on the pay shoot by numerous open cuts extending over 600 ft. in length. At each place he has attained a depth of seven to ten feet, and in each he has at the bottom 10 in. of ore running from $50 to $200 a ton in free gold, while the porphyry gangue has a width of about four feet. The ore is rich in galena, and yet the gold is free milling. A late assay shows the presence of bismuth in one place. The vein is a fissure, crossing the country rock. The granite below the foot-wall is white and barren, while that above the hanging wall is heavily mineralized. The ledge has a dip of 45°.

Shoshone County.

(Special Correspondence).—The Hecla Mining Co. at Burke has declared a monthly dividend for March of $70,000, bringing the total dividends to date to $600,000. Of this amount $240,000 were declared last year, and thus far $90,000 this year. The 2,000-ft. drift being driven on the 900-ft. level, the engineers say, is within 50 ft. of the ore shoot, which on the 600 level has been found to be rich, and from which dividends are being derived.

Spokane, March 24.

The Grizzly Bear fraction, Butte, Anaconda, Bearpaw, Silver Bow, Silver Tip, Independent, Washington, Wheeling and Salem mining claims have been transferred to the Bear Mountain Mining Co. The claims lie on Beartop, adjoining and directly east and north of the Beartop Mining Co.'s ground. The group reaches the summit of the Bitter Roots. It is to be explored by a long tunnel, work on which is to be commenced as soon as the incorporators get down to business. All the owners are residents of Missoula, except Mr. Manley.——Mr. Clark says he will run a tunnel, and that prospecting is only in its infancy in the Silver City district, and that a few years more will serve to discover many lodes as valuable as have ever been before found. ——The Monitor mine, south of Saltese seven miles, is the only property in that section of the Cœur d'Alene which has shipped largely the past year. Last fall about $20,000 worth of high-class copper gold ore was marketed, operations being ended by Cœur d'Alene parties taking a bond on the property for $200,000. Since that time a strike of seven feet of solid chalcopyrite carrying gold has been reported, but no attempt will be made to ship again until the snow goes off sufficiently to make the road passable for heavy hauling. In the meantime, the mine is being put into such shape that extensive and continuous operations in development and stoping may be possible. The shaft, now down 300 ft., is being enlarged to double compartment and newly timbered. Adjoining the Monitor, and on the same vein, is the Richmond, which has good chances of making a producer.——The Flynn Group Mining Co., at Black Bear on Cañon creek, is driving a crosscut tunnel to tap the extension of the Black Bear Fraction Mining Co.'s ground. The latter company owns a group of claims east of the Helena-Frisco mine, which covers the faulted sections of the Frisco vein, they being the Gem, Frisco, and west end of the Black Bear. The tunnel is large enough for double track. The vein on the surface is marked with boulders of iron oxide.

R. de B. Smith of Anaconda has bonded the Tamietti placer mines, near Dry creek, in the Cœur d'Alene district, to Eastern men for $150,000. The placers are among the most important in the State. Mr. Smith will be general manager. The company will take up the bond in three payments. After the second payment the company will be in complete charge of the property. At present the owners are working them while the new company is engaged in having roads constructed and otherwise improving the property.

Washington County.

The Idaho Placer Mining Co., Ltd., is to resume operations. The dredge and machinery is in good condition. The property of the company is situated at Old's Ferry, a few miles west of Weiser, on Snake river. If the trial run proves successful another and larger dredge will be built.

MONTANA.

Fergus County.

An accident at the Barnes-King mine, near Kendall, occurred last week when the gear wheel on the hoist broke in several pieces, while the engineer was hoisting ore. One piece struck the chair on the platform, shattering it. Another piece struck the wall above the head of the engineer, A. C. Dilly, and fell back, striking him on the shoulder and leg, and bruising him painfully. Mr. Dilly threw on the brake, and the skip hung up on the safety catches a little above the 100-ft. level. The hoist will probably be shut down until a new one can be shipped from Anaconda.

The Queen Mining Co., controlled by the Foleys, will put down the shaft on that property itself, instead of having the work done by contract. In addition to this, the company will do some diamond drill work on parts of the ground not previously explored.

Granite County.

Superintendent F. G. Wagner, of the Albion Copper Mining Co., of Princeton, reports resumption of work at the Tussle mine, near Royal. On March 1 work was suspended at the Tussle mine and Carl Bergstrand, representing the original owners, ordered everything shut down because the Tussle company had failed in its agreement to sink the shaft to a certain depth by that time.

The Senate group of mines, situated in the Moose lake country, has been bonded to a man named Silliman, who is in possession of the property. The Senate group was located 12 years ago and is owned by Thomas Leary and several other Anaconda parties. Considerable development has been done.

J. P. Dunn & Co. are shipping ore of high grade from the Lincoln group to Philipsburg, from where it is sent to the smelter. The wagon haul is about 30 miles. The same company is engaged in overhauling the Berrin quartz mill and in a few weeks it will be started up.

The Moose Lake Mining Co. has men running a tunnel and drifting on a vein at the present time, but in a few weeks a large force will be put at work. This property adjoins the Lincoln group and has a large vein of good milling ore.

Many Anaconda people are interested in the mines in that country and there is probability that a lot of development work will be done there during the coming summer.

Lewis and Clark County.

Eighteen miles north from Helena, on the copper lode known as the Helena Quartz Mining group, owned by C. H. McKinney and J. Hamlin, some months ago a lease and bond was given to D. Millner, of Helena. It is claimed that this property was at one time a shipper of gold-silver-copper ores to Freiberg; but as most of the result was absorbed by excessive charges, it was shut down and almost forgotten. There is a 50-ft. crosscut tunnel and nearly 400 ft. of drift on the lead. On taking over the property, Millner and a helper re-timbered the old works, and, when 78 ft. in, while setting a timber in the supposed foot-wall, it occurred to him that it was only a false wall. A crosscut was made, and in 18 in. Millner found a parallel lead, which Mr. McKinney says runs higher in gold alone than the combined former values in the three metals.

Missoula County.

W. K. Edwards, superintendent of the Iron Mountain Tunnel Co., has secured men and machinery to operate the properties. He will work 35 men during the summer. Mr. Edwards says the tunnel will be run 5,000 ft. and will tap the old shaft at a depth of 1,750 ft. It will require from 15 to 18 months to complete the tunnel. At this point a station will be cut and a hoisting plant installed underground to sink a shaft, where, it is said, there is a shoot of ore 4 ft. wide and 550 ft. long. The proposed work will cost $75,000.

NEVADA.

Virgil G. Bogue, vice-president and chief engineer of the Western Pacific railroad, will ask for bids on the construction of 109 miles of roadbed in Nevada, embracing practically all the heavy work not already under contract between San Francisco and Salt Lake. The 109 miles extend from the Nevada-Utah boundary to Deeth, on the Humboldt river. The contract to be let will call for 25 miles or more of heavy rock work and all of the tunnel work embraced in the engineering plans in the eastern end of Nevada. Plans have been approved for a tunnel 12,000 ft. in length, through what is known as the Gosiute range. The prosecution of the tunnel work will be so regulated that it will be completed as early as the remainder of the line. It would be possible, if necessary, to work from four different shafts, but it is probable that not more than two shafts will be sunk, thus permitting the excavation of the tunnel to proceed on six headings at the same time. The construction work between Deeth and the Nevada-California boundary is all of comparatively light character, and for this reason it will not be placed under contract right away. Work is to be pushed on the construction of the line east of Deeth, and it is expected that large construction forces will be working in Nevada this summer. Construction work in California has been progressing, but is retarded by continued wet weather. From 7,000 to 8,000 men will be at work with the Western Pacific construction forces during the coming summer.

Churchill County.

The people of Fairfield are reported to be picking up the boulders on the hills surrounding their camp as well as on the streets of the town, sacking them and shipping them to the smelters for the gold they contain, some of the black, grayish looking rocks giving $300 per ton. For years people passed over the country from which these boulders were gathered. It is float and until a few months ago was looked upon as worthless. Lots on the main street of the new townsite of Hazen are selling for $1,500 each and are hard to get at that price. The mining boom in the southern end of Churchill county and increased mining activity north of Hazen have caused the rise in price.

Esmeralda County.

At the Mason Valley, near Youngstown, a strike was made in the mine recently. The company has been driving a tunnel on the Dewey claim to tap the ledge seen on the surface. This ledge has been encountered in the face of the tunnel, which so far shows 18 ft. of ore, which will assay from 5 to 7% copper. The management has started a lower tunnel, which will be 1,000 ft. in length, giving a depth of over 400 feet.

Humboldt County.

A discovery of gold is reported 35 miles west of Lovelock, near what is known as Seven Troughs, in the Marzen range. The ore is in veins said to be 12 to 20 ft. wide. The country is accessible to transportation; the survey of the Western Pacific passes directly through part of the district. The existence of gold quartz in the desert country bordering the eastern slope of the Black Rock desert has long been known. Wash gravel carrying gold has been found from Rattlesnake Springs to Rabbit Hole. Borland, the Lovelock rancher, is reported to be the principal locator. Lovelock is the nearest point from the railroad, but there are good roads from other points along the Southern Pacific track, especially from Winnemucca.

Lincoln County.

(Special Correspondence).—Official statements of A. G. Wells, of the Santa Fe, and Dr. Homer A. Hansen, of the Searchlight Northern Railway, both give assurance of the construction of their railroads in the immediate future. The engineers have completed their surveys and the work of construction is assured, grading having already commenced on the Santa Fe. Searchlight and the surrounding districts are consequently feeling a wave of prosperity. Reports from the Boulder show that crosscutting is meeting with success. A large body of medium grade ore has been encountered and the company will continue this work until the Quartette lead, which is believed to traverse the ground, is reached. Copper-stained ore has been found in the workings of the Searchlight Treasurer Co.'s property, the formation being similar to that of the Duplex and Quartette, its nearest neighbors.

The Nevada Consolidated Mines, Ltd., the latest corporation to invade Searchlight district, has commenced work on their holdings, formerly known as the McGhan & McLaughlin group of 20 claims. Men are now building quarters and preparing ground for the installation of machinery. The Searchlight Parallel is prospecting the 400-ft. level to catch the ore shoot being worked on the 300-ft. level.

The Cyrus Noble is sinking for the 1,000-ft. level. The entire bottom of the shaft is in excellent ore. The new electric plant is installed and everything moving with regularity. It is unofficially announced that a dividend will be declared during April.

The Quartette has found free gold ore running $600 per ton in crosscutting on the 900-ft. level. The ledge was found where it was calculated to be, and the crosscut, in 15 ft., has not yet cut the opposite wall.

The Cyrus Noble Extension is trenching on the Nonpareil claim to find the location of the lead, which it is believed traverses this claim.

The Duplex Mining Co. is installing two new hoists and a cyanide plant to handle the accumulated 18,000

tons of tailings. This company contemplates adding 40 stamps, making it one of the largest stamp-mills in Nevada.

Le Roy Mining Co. is meeting with good results on the 200-ft. level, a body of $12 free milling ore having been encountered. The width of this body has not yet been ascertained. When the new pump arrives sinking will be continued.

In El Dorado district several new companies are starting up and meeting with encouraging results. The Black Hawk Co. is working three shifts on the main shaft. When the new 10-stamp mill is complete this company will be a steady producer. The Venus continues in ore found in the upper workings.

The bond of $50,000 on the Mountain group was taken up by Messrs. Gresh & Roberts. The new owners propose to develop the property.

The Purnell group, in Sunrise district, was bonded to an Eastern syndicate for $15,000. Good ore has been struck on the Turner group while digging an assessment hole. The ledge averages $20 in gold and silver per ton. This ledge can be traced for 3,500 ft. along the surface.

Searchlight, March 25.

The Johnnie Consolidated Gold Mining Co.'s property consists of 12 patented claims, of which the Johnnie is developed to a depth of 700 ft. Over 4,000 ft. of work has been done, opening up levels 100 ft. apart to the 700-ft. level, and exposing a large tonnage of free milling ore which assays from $6 to $20 per ton. Work is now being pushed on the 700-ft. level, where a crosscut is being run to the orebody. Each level from the 600 up to the surface has been opened north and south on the orebody, showing ore on every level to that depth. Work has also been done on the south end of the property, where shaft No. 3 has been sunk to a depth of 100 ft., with a crosscut at this level, in ore. The Minnie Mae shaft is 50 ft. deep, with a drift 45 ft. in ore. Numerous open cuts and trenches have been made on the surface on the south end of the property. The company has decided to adopt the leasing system on the south portion of the property, where the surface gives indications of sufficient value to yield shipping ore, and with the completion of the Salt Lake Railroad from Las Vegas to Tonopah, leases can be had on terms that will undoubtedly make leasing an object. The property is well situated as to water, having two springs, from which an abundance of water for milling and camp purposes flows by gravity to the mine through a two-inch pipe

The Starlight, located near the Mayflower, eight miles north of Beatty, on which a strike was made a short time ago, has been taken under option by Curtis Mann, of Rhyolite, and J. B. Campbell, of Goldfield. The owners of the property are N. S. Marks, C. E. Hancock, J. L. Gaut and W. H. Bond, of Beatty.

Lyon County.

In the Dewey tunnel on the Dyer, being operated by the Mason Valley Copper Co., the ledge shows a width of 30 ft. and has not yet been crosscut to the wall. In the last few days a foot of high-grade ore was cut in this ledge—black oxide, which carries 40% copper.

Nye County.

A strike of 18 in. of shipping ore on the Transvaal property, a half mile south of the Eastern Contact, 15 miles northeast of Beatty, is reported by E. S. Chafey. At a depth of three feet the ore was 18 in. wide and panned over $100 to the ton. It was traced for a distance of 1,000 ft. on the surface and runs direct into the Eastern Contact ground. The Transvaal was formerly owned by E. S. Chafey and George Probasco, but an interest was sold for a good cash sum to R. W. Gorrill and J. C. McCormack. The strike was made by H. Gorrill. The formation is similar to that of Goldfield.

NEW MEXICO.

Colfax County.

It is reported that the iron deposits of Iron mountain, on the western slope of Old Baldy, near Elizabethtown, are to be worked on a large scale. The ore will be shipped out of Elizabethtown over the St. Louis, Rocky Mountain & Pacific Railway in the early part of its development, but gradually plants for its reduction and manufacture will be established near the mines and in the vicinity of Raton.

Santa Fe County

Mines at Cerrillos and Golden are changing hands. Colorado men have recently been buying up zinc mines around Cerrillos. Formerly the mines carrying zinc were unprofitable, but with the improvement in mining machinery and the high price of zinc this has changed and zinc is in demand. The Keystone mill for the handling of lead-zinc ores is to start up soon. The ores in the Cerrillos district are mostly heavy sulphides of lead and zinc carrying silver, gold and copper. At Golden the Gold Bullion placer plant is being installed, and the Racine Mining Co. are preparing to work the ground. The Ora Quay Co. has bought the Perry group and intend to install machinery. J. L. Lopez, of Santa Fe, is working the San Miguel claim. The Yankee Boy is being worked by Geo. S. Morrison. The San Pedro copper mine and smelter remain idle. G. Alexander leased the Las Vegas mine from the Argo Mining Co., and Geo. Morrison and Geo. Adriana have leased a third interest in the Gold Coin claim in San Lazarus gulch to S. Brown and R. J. Brenk, of Milwaukee. At the Hagan coal mines Superintendent Sullivan says he has the mines in shape to ship 25 cars daily when the railroad comes in.

OREGON.

Grant County.

A. Glenn and W. A. Peet have a prospect on Rabbit creek, five miles from Red Boy, known as the Baby Don group of six claims. There is also a water right on Rabbit creek that belongs with the property. In developing the property 10 ledges have been exposed, all of which pan gold. On the Baby Don ledge, 200 ft. of crosscuts and drifts have been run.

UTAH.

Summit County.

Little Bell is reported to show an improving condition. Since the first strike in the mine was made several weeks ago, the orebodies have continued to open up strong, and the ore-bins contain 800 tons of high-grade ore. Workmen are shoveling the snow from the road between the Bell and the Daly-West, and shipping has commenced. The ore will net the company approximately $50 per ton.

At the Silver King Consolidated the report has gone out that gold-bearing ore, running $22 per ton, has been encountered in the shaft. The ore was found in the last one of several fissures which have been cut in the shaft since leaving the 900-ft. level. The shaft is now approaching the 1,100-ft. level, where a station will be cut and a crosscut run to tap them.

Work at the Ontario drain tunnel is going steadily ahead. The new drift, after being run 100 ft. at an angle from the main tunnel, will continue parallel with it until the cave-in has been passed.

Beaver County.

The Horn Silver Mining Co. had a surplus of $55,770 at the close of its past fiscal year, against $70,726 at the end of the previous year, being a decrease of $14,956. The manager reports that work was delayed during the entire year, owing to inability to get miners.

WASHINGTON.

Ferry County.

(Special Correspondence.)—The exhibit at the annual stockholders' meeting of the Pearl Consolidated Mining Co., operating in Republic, which was held March 20, shows that the mine is being well managed and the indebtedness steadily reduced. Considerable development was done during the past year, and the mine is looking well today. Arrangements are in progress to increase shipments of ore. A winze is being sunk on the pay shoot from the adit, and a raise is being driven from the 190-ft. level to meet it. Stoping will begin as soon as the connection is made.

Following the reports of success in concentrating at the Mountain Lion mill, the mine has again been closed down, and both miners and mill hands have filed liens for wages long past due. Lack of cheap treatment for the ore has always been a detriment to the camp, the mines being dependent in a great measure on smelters for disposal of the ore. The Mountain Lion Gold Mining Co., December 1, 1903, gave a mortgage on the mine and mill for $60,000, in favor of Albert MacLaren, who, April 17, 1905, commenced suit to foreclose and determine the lien. The present management, it is understood, has offered Mr. MacLaren a proposition to continue work in the mine, provided he will extend the time for payment of the mortgage another year. Since that, it is reported that an engineer's report has shown that in place of 200,000 tons of $10 ore previously reported as above the 600 level, there is only 10,000 tons, which would net $29,000. The company is resisting payment of the mortgage. The entire indebtedness of the company has reached $90,000.

The Ben Hur is shipping ore, as usual. The Quilp is increasing shipments to 35 and 40 tons daily. The Belcher company is reported to be pushing a raise on the Belcher vein from the No. 2 to the No. 3 tunnel. This appears to be the first step taken toward stoping since the crosscut was finished on No. 3 level.

Republic, March 25.

Okanogan County.

(Special Correspondence.)—The official report, not yet published, of the Copper World Extension Co., operating on Palmer mountain, verifies recent favorable statements concerning that property. The first ore struck on the 200-ft. level was in the south crosscut, 125 ft. from the shaft, and consisted of three feet of solid sulphide ore, carrying copper, gold and silver, and a large excess of iron; then 20 ft. of interstratified dolomite and slate, with streaks of concentrating ore. The drills broke into a solid body of iron sulphide 145 ft. from the shaft, which continued solid across 23 ft. Samples from different parts of that body assayed from 3.5 to 27.2% copper and a little gold. The first section of 10 ft. averaged 7.9% copper, and 5.84% was the average copper content of the whole 23 ft. Following that, the crosscut was driven 33 ft. in bluish white dolomite, which had been regarded as quartzite. A drill hole in the roof and another through a slip on one side of the drift, 200 ft. from the shaft, disclosed solid ore in both places. At 245 ft. the crosscut ran into ore of a different character, and had penetrated it 20 ft. at the date of the report. In this body the copper occurs in the form of chalcopyrite, carrying gold. This ore does not carry as large an excess of iron as the 23-ft. body, the chalcopyrite occurring in streaks through the gangue, and the whole mass, it is thought, can be handled by concentration. The crosscut is now in 275 ft., but no wall has been found.

A report has reached Republic of rich ore in a recent strike on the Stemwinder, at Sheridan, and ore from an 18-in. streak has been exhibited. This prospect shows four feet of shipping ore in a vein six feet wide, exposed in an open cut 30 ft. deep at the face. The vein parallels the Phil Sheridan, and the showing is 75 ft. from the north end-line of the Kismet Fraction, one of the claims of the Phil Sheridan company's group.

Molybdenite, in bunches, in a vein from 1 to 50 ft. wide, is reported to have been encountered in the Mineral Hill Mining company's property, by E. P. Wheeler, superintendent, at Conconully. A Philadelphia firm offers $100 a ton for the ore and $600 a ton for the concentrates. Three veins have been cut in a tunnel 850 ft. long, which carry gold, silver, lead, copper, and zinc, paralleling the molybdenite deposits.

Republic, March 24.

Stevens County.

(Special Correspondence).—Indiana people have taken the Orient mine, on Toulon mountain, and, after two years, work has been resumed. The property was equipped with an air compressor and a boiler. The main vein is about 100 ft. wide and carries gold, copper, and a little silver in quartz gangue. Some of the ore assayed from three to four per cent nickel. Some shallow holes, one of them 30 ft. deep, have been cut along the surface. A tunnel was driven 800 ft., intersected three or four blind veins and ran into broken ground. It will be driven to tap the main vein. A winze was sunk from the tunnel, on one of the veins, to a depth of 30 ft., and the ore ran $18 per ton, mostly gold.

The Abe Lincoln, near Rock Cut, has a vein of gold-bearing quartz 2½ ft. wide, opened by two shafts, 32 and 61 ft. deep, respectively. It has been idle for a long time, but the company contemplates re-opening it.

Colville, March 25.

Metalline camp, on the Pend d'Oreille river, is again attracting attention to its low-grade lead properties. L. P. Larson says his plans are not completed, but he expects to build a 500-ton concentrator on the river, near the big falls. The problem of getting in the plant and taking out the concentrate is not difficult. He has been negotiating for leases on various properties and there should be no difficulty in getting 500 tons a day.

WYOMING.

Carbon County.

It is reported that the Penn-Wyoming Copper Co. will resume operations on the Ferris-Haggarty. J. Manson, former underground foreman, will take charge of the work. Work will be commenced with a small force, which will be increased as spring opens. Development will keep them busy until ore can be taken to Encampment over the tramway.

Frank O. McCormick has opened up a property on North Fork and is showing specimens of gray copper taken from a depth of 10 ft. in his claim.

There has been a lot of work done on the Charter Oak, near Saratoga, since last September. Manager Hassett has built a shaft-house 28 by 40 ft., also a headframe, installed two 50-h.p. boilers; a 20 h.p. hoist, and an air compressor, besides having sunk 45 ft. on shaft No. 2 and 300 ft. on No. 3. At the latter ore was struck in less than a foot from the surface. The shaft is now down 300 ft. on the vein.

A few days ago Mr. Hassett put men on the Iroquois, the northeastern extension of the Charter Oak, and in two days they opened up a vein of copper ore nine feet in thickness and had not reached the opposite wall. This is where the vein is cut by Calf creek. Men were also put to work on the southeastern extension on what is known as the Puzzler. A drift was run 50 ft. along the side of the mountain, exposing a body of ore. Thus the Charter Oak vein has been opened in places for two miles.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Yale District.

The Granby Consolidated Co. will increase its smelter capacity to handle 3,500 tons a day, instead of 2,000 tons, which is its present capacity. That will give an increase of about 75%. The Granby is producing copper at 8c. per pound, though some months the cost runs slightly above that figure, but it never touched 9c. per pound.

Owing to one of the Granby smelter's furnaces being out of commission a few days for repairs the past week, the output of Boundary mines ending March 24 was less than usual. Figures for the week follow: Granby mines to Granby smelter, 14,556 tons; Mother Lode to B. C. Copper smelter, 3,232 tons; Brooklyn Stemwinder to Dominion smelter, 240 tons; Sunset to Dominion smelter, 900 tons; Emma to Nelson and B. C. Copper smelter, 198 tons; Oro Denoro to Granby smelter, 396 tons; total shipments for the week, 22,790 tons; total for the year to date, 287,649 tons.

Smelter treatment for the week was: Granby works, 15,480 tons; B. C. Copper works, 4,380 tons; Dominion works, 4,408 tons; total for week, 24,628 tons; total for year to date, 299,949 tons.

It is announced that more improvements will be made at the Granby smelter this spring, the most important being the replacing of all woodwork in the plant by steel. The framework will also be replaced by steel, and the roof, where needed, will be shingled with steel shingles. It is estimated that the cost of this re-building with steel will total about $50,000.

The feature of the mines continues to be the strike in Le Roi east of the Josie dike. Nothing is known officially concerning the strike, but it is reported that the orebody has been drifted on 100 ft. on the 800-ft. level, west of the dike, and it is known that the values are good. The orebody has not yet been crosscut.

Ore shipments for the week were: Centre Star, 3,150 tons; Le Roi, 2,760 tons; Le Roi No. 2, 280 tons; total for the week, 6,390 tons, and for the year, 72,745 tons.

George Crearer, of the Dominion Copper Co., Julius Ehrlich, of Greenwood, and Karl Holman, manager of the Mother Lode mine, have bonded the O. K. mine, nine miles from Grand Forks. It is reported the price is $30,000, extending in payments over 18 months. The O. K. is up the North Fork and joins the Humming Bird. Work is to start April 1.

NOVA SCOTIA.

The Mic Mac mine, in the Leipsigate gold district, near Bridgewater, has been sold to New York people, who have incorporated under the title of the Mic Mac Gold Mining Co., with a capital of $1,500,000, divided into 300,000 shares of $5 each. The corporation is organized under the laws of the State of Maine.

MEXICO.

Oaxaca.

The Marseilles Mining Co., whose property is situated five miles southeast of Ejutla, has at the 100-ft. level uncovered a 15-ft. body of smelting silver and copper ore. ——The San Martin, bought last year by F. A. Heinze, is in good shape, and it is said this property alone could supply the new Oaxaca smelter with more copper ore than they expect to handle at the start.

Personal.

OLIVER P. POSEY is at Tonopah, Nevada.

WALTER P. JENNEY is at Manhattan, Nevada.

W. D. THORNTON, of Butte, is now in New York.

ARTHUR L. WALKER has returned to New York.

G. W. GRAY has returned to London from Borneo.

POPE YEATMAN, of New York, is in San Francisco.

H. C. BACON left Butte for New York on March 23.

EDGAR RICKARD is on his way back from New York.

ERNEST A. WILTSEE has arrived in San Francisco from Mexico.

LEO VON ROSENBERG, of New York, returned recently from Mexico.

H. H. DYER is now superintendent of the Shannon mine, at Clifton, Arizona.

JOHN B. FARISH has postponed his departure in order to see some California mines.

COURTENAY DE KALB has returned from Sinaloa, Mexico, to Mojave, California.

VICTOR G. HILLS, of Cripple Creek, is on his way to examine mines in New Mexico.

J. C. DALY, JR., of Boston, is now with the Selby Smelting & Refining Company.

CHARLES H. HOFFMAN, M. E., of Valardeña, Mexico, was at Salt Lake City recently.

JAMAIE CONNOR, of Colorado Springs, is expected in San Francisco from New York.

FRED G. FARISH is on his way to Sinaloa, after a visit to mines in Guerrero, Mexico.

W. E. DEFTY, of Phœnix, Ariz., will be making examinations in Oregon during April.

W. H. BREVOORT is in San Francisco on a visit to the mines in which he holds an interest.

THEODORE S. HOOVER'S address is care of the United States Banking Co , City of Mexico.

FREDERICK H. MINARD, of Denver, visited San Francisco on his way to Mazatlan, Mexico.

H. C. TREADGOLD has left San Francisco and is now at the Auditorium Hotel, at Chicago.

R. B. LAMB, manager of the Daly Reduction Co., at Hedley, B. C., has gone to New York.

D'ARCY WEATHERBE is engaged in investigating dredging methods at Oroville, California.

J. F. HALLORAN is now at New Orleans. He will proceed shortly to Europe on a year's holiday.

D. O. DARNELL, JR., lessee on the Little May, Cripple Creek, was in Denver several days last week.

W. HUTTON-WILLIAMS is on his way to Korea, to be assistant engineer to the Korean Syndicate.

L. W. MAYER, connected with the Guggenheim staff of engineers, was at Salt Lake City last week.

CHAS. H. ABBOTT sailed from New Orleans on his way to El Rancho, in Guatemala, Central America.

R. C. TURNER has been appointed superintendent of the Tonopah Mining Co., at Tonopah, Nevada.

CHAS. W. GOODALE and H. V. WINCHELL, of the Amalgamated Copper Company, are both in New York.

W. H. KRITZER is convalescing at San Francisco from an operation performed on the bones of his ankle.

HENRY E. WOOD and J. W. BENSON of Denver are in San Francisco, on their way to Yreka, in Siskiyou county.

H. PARK, of Salt Lake City, has been making an examination of the Sunset mine, at Deadwood, British Columbia.

JUAN FELIX BRANDES was in San Francisco on his return from Mexico, but he left almost at once for Denver, on his way to London.

JOHN HAYS HAMMOND, having got the best of a threatened attack of pneumonia, has gone to Los Angeles to recuperate.

DAVID COLE, superintendent of the concentrators at Cananea, has been investigating the concentrating practice at Bingham, Utah.

WILLIAM J. COX, general manager of the Camp Bird mine, has arrived in San Francisco to consult with Mr. JOHN HAYS HAMMOND.

LAFAYETTE HANCHETT, manager for the Newhouse mining interests, with headquarters at Salt Lake City, is at Los Angeles on a holiday.

A. F. HOLDEN, managing director of the United States Smelting, Refining & Mining Co., is inspecting the Utah properties of that corporation.

DONALD WOODRUM, manager of the Red Mountain Consolidated Gold Mining Co., has returned from the East and is at the mine in Plumas county.

F. L. UNDERWOOD, president, with W. H. THOMAS, engineer, and J. E. MCALLISTER, manager, are at the mines of the British Columbia Copper Co.

HEWITT, CARSTARPHEN & CO., mining engineers of Denver, have recently been doing professional work at Kokomo, Georgetown and Colorado Springs.

GEORGE M. SNOW, general manager of the Trapper's Flat Mining & Milling Co., Thunderbolt, Idaho, has returned to Nampa after a two weeks' trip to New York.

L. A. COPELAND, manager of the Taylor & Brunton samplers at Salt Lake, and president of the Nevada Gold Butte Mines Co., is inspecting the property of the latter in Lincoln county, Nevada.

Latest Market Reports.

SAN FRANCISCO, March 29, 1906.

ANGLO-AMERICAN SHARES.

London, March 29, 1906.

	£ s d		£ s d
Camp Bird	1 4 0	Oroville Dredging	0 19 3
El Oro	1 9 3	Stratton's Independence	0 7 6
Esperanza	4 2 6	Tomboy	1 0 9
Dolores	1 17 6		

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. March 29, 1906.)

Amalgamated	$107¼	North Butte	$ 83½
Anaconda	272¾	Old Dominion	45
Bingham Copper	39½	Shannon	7¼
Cumet & Hecla	695	Tennessee Copper	47
Daly West	14	Tonopah-Nevada	18
Granby	13	United Copper	67
Greene Consolidated	30	United States	59½
Nevada Con. Copper	18¼	Utah Copper	29

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 30	Ophir	$4 95
Hale & Norcross	1 10	Potosi	0 14
Mexican	1 10	Savage	0 70
Exchequer	0 56	Yellow Jacket	0 09

[Tonopah and Goldfield.]

Belmont	$5 50	Montana-Tonopah	$2 97½
Golden Anchor	1 20	Ohio-Tonopah	0 48
Jim Butler	1 60	Red Top	1 95
Jumbo	1 77½	Sandstorm	1 40
Kendall	0 92	Tonopah Ex	11 00
Midway	2 25	West End	2 95

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 64¼c. per fine ounce; San Francisco, 64¼c.; London, 30d. (standard ounce, 925 fine); Mexican dollars, 50@51c., San Francisco; 50c., New York.

COPPER.—New York (by wire, average for week ending March 29), Lake, 18.62@18.75c; Electrolytic, 18.25@18.50 Casting, 18.00@18.25c. per pound. Mill copper plates, $21; bars, 21@24c. London: £81 15s. spot per ton.

LEAD.—New York (by wire, average for week ending March 29), $5.35 per 100 lb; San Francisco, pig, 5.70@6.60c. per lb.; pipe 7¼c.; sheet, 8¼@9¼c.; London: £15 17s. 6d. ₱ long ton.

SPELTER.—New York (by wire, average for week ending March 29), $6.15@6.20 ₱ 100 lb.: London, £24 15s. ₱ ton; San Francisco, ton lots, 7c.; 100-lb lots, 7¼c.

TIN.—New York, pig, $37.25@37.50; bar tin, ₱ lb., 42½c.; pig, 39c. London, £168 5s. 0d.

PLATINUM.—San Francisco, crude, $18.50 ₱ oz.; New York, ingot, nominal, $23@25 ₱ Troy oz. Platinum ware, 75@$1.00 ₱ gram.

QUICKSILVER.—New York, $40.00@$41.50, large lots; London, £7 7s 6d.; San Francisco, local, $39.00 ₱ flask of 75 lbs.

NICKEL.—New York, 48@60c ₱ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c.; dust, ₱ lb., 10c.; sulphate, ₱ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 35@38c. ₱ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35; gray forge, $17.85; San Francisco, bar, 3½c. ₱ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.00 open hearth billets, $28.00; San Francisco, bar, 7c to 13c ₱ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8½c.; less than 500 lb., per lb., 8¾c.; in 25-lb. tin pails, ¼c. ₱ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ½c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8¼c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $3.00@4.00 ₱ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ₱ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 17@18c; San Francisco, 1000-lb. lots, 16c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ₱ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ₱ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8½c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11½c; 14 oz., 10@10½c; 12 oz., 9½@9½c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton. 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c ₱ lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.10@1.20 ₱ 100 lbs.; sks., 90c@$1.00: chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulphate, 6½@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

COAL.—San Francisco, coast, yard prices to dealers: Wellington, $7.50; Seattle, $6.50; Coos Bay, $5.50; Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, bd., $14.00; Scotch, $8.00; Cumberland, $14.00; Cannel, $8.50; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ₱ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

Books Received.

'Electric Power Plants,' by Norman H. Schneider, is a book which will find a ready sale among those desiring a general and comprehensive knowledge of electricity and its application. It contains chapters on standard wiring; direct and alternating-current generators, motors and motor starters; testing and measuring instruments; the storage battery; the incandescent lamp, and general engineering notes; 290 pages, 203 illustrations. This book will be sent on application by the MINING AND SCIENTIFIC PRESS on receipt of the price, $1.50, in cloth: Skan & Chamberlain, publishers, 123 Liberty street, New York.

'The Structural and Industrial Materials of California' is the title of Bulletin No. 38 of the State Mining Bureau of California. The volume is profusely illustrated and covers about everything in the way of mineral that has structural value in the State, but necessarily a treatise dealing in so wide a range of materials must be somewhat superficial in its character. This bulletin will be of value to those engaged in the production of the various classes of building material, and of general interest to others. It may be had by application to the State Mining Bureau at San Francisco. Price 75c., postage 20c. additional.

Trade Treatises.

The Colorado Iron Works Co., of Denver, has issued its fourth quarterly bulletin, which contains interesting contributions by various authors, the most important being 'Modern Cyanide Plants,' by John E. Rothwell.

The H. D. Crippen Manufacturing Co., of 25 Broad street, New York, has issued Catalogue No. 10, descriptive of the box electric drill, in which is described and illustrated the box electric drill working under varied conditions, by which prospective buyers may determine the size and style best suited to their wants.

Commercial Paragraphs.

KAUL & HALL LUMBER CO. has placed an order for one 65-ton Shay locomotive, and George Cousin, Louisiana, has placed an order for one 20-ton Shay locomotive.

IN order to better handle their increasing business from the Rocky Mountain district, the Power & Mining Machinery Co., Milwaukee, Wis., have opened an office at 312 17th street, Denver. This new office is in charge of Henry F. Jurs as district manager.

THE Bertha Mineral Co. has bought a 25-ft. Hancock jig and four No. 3 Overstrom tables from the Allis-Chalmers Co. of Milwaukee. The Butte & London Copper Co. of Butte recently purchased from the Allis-Chalmers Co. four 150-h.p. boilers, with feed pumps and mine pumps, for new properties recently acquired.

MR. CHARLES C. KNAUSS, who has been manager of the Allentown Foundry & Machine Works at Allentown, Pa., since the spring of 1900, has resigned in order to accept a similar position with the Traylor Mfg. & Construction Co., whose new works for the production of mining, milling, concentrating, reducing and crushing machinery at Allentown are just being completed.

Obituary.

N. A. ARNOLD, an aged Tuolumne county, Cal., miner, was found dead at his mine on Yankee Hill, near Columbia, on the 27th inst. It is supposed he died from exposure.

C. H. ELLIOTT, of the firm of Patrick, Elliott & Camp, died at Goldfield, Nev., on the 14th inst. He was one of the prominent men in southern Nevada. MR. ELLIOTT was born in Indianapolis, Ind., in 1864. He went to Tonopah in its early days and did much in the upbuilding of that camp.

CAPT. JOHN PENGILLY, well known in the Lake Superior region as a mine manager, died in Arizona last week at the age of 53 years. He had been engaged, just prior to his death, in introducing the caving system of mining in the mines at Cananea, as practiced in the Lake Superior iron region.

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ASSAYER'S GUIDE.
Lieber; 283 pp.....$1 50

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MANUAL OF PRACTICAL ASSAYING.
H. Van F. Furman; 463 pp.....$3

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Clennel; 160 pp.....$2 50

CHEMICAL ARITHMETIC, ELEMENTARY, 1100 PROBLEMS.
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CHEMICAL AND METALLURGICAL HANDBOOK.
Cremer and Bicknell; 250 pp.....$3 50

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SAN FRANCISCO, APRIL 7, 1906.

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EDITORIAL.

OUR columns are honored with a contribution by Dr. R. W. Raymond, who writes on a matter concerning which he is particularly authoritative. As the author of a metrical version of the Book of Job, and a veteran Bible scholar on the one hand; as former U. S. Commissioner of Mines and the present Secretary of the American Institute of Mining Engineers, on the other hand, his interpretation of the many references to mining appearing in that well-known writing, entitled the Book of Job, will be read with peculiar interest.

IT is well to be told the good features of a new stamp-mill or any other mining equipment, but it is even more useful to be informed of the weak points when they are developed in the course of daily work. The splendid mill recently erected by the North Star Mines, at Grass Valley, will not lose in the estimation of engineers by reason of Mr. Arthur D. Foote's statement of certain features that have proved undesirable. Professional men will appreciate the description of the mill as given by the distinguished manager of the North Star Mines Company. We have considered the photographs so excellent as to warrant the printing of them on special paper.

PITTSBURG has become a lively mining center, of late, the sale of stocks on the curb aggregating an average of 50,000 shares daily. This does not include the regular business in mining stocks on the Exchange, where, for example, as many as 522,247 shares of Ohio-Tonopah were dealt in during January and February. The success of Pittsburg speculators in mines at Tonopah and at Bisbee has stimulated widespread interest, for many fortunes have been made out of Tonopah Extension and Calumet & Arizona. The consolidation of steel companies made millionaires vulgarly plentiful at the great coal center and has furnished the sinews of business to a large number of restless men.

DATA concerning the flow of pulp through pipe are lacking, therefore the following facts will prove useful: At the Bustos mill, at Guanajuato, Mexico, the pulp to the cyanide annex flows through a line more than a mile long, of eight-inch cast-iron water-pipe, of the bell and spigot type, with a gradient of 3.5 per cent for the first 800 ft. and 2.25 per cent for the remainder of its length. By accident, a couple of tons of almost dry 20-mesh sand was suddenly injected at the head of the pipe-line, but it was not choked; notwithstanding this severe test, it cleared itself completely in two minutes. Some of our readers may be able to quote other experiences bearing upon this subject, which is important to those in engineering practice.

MINE LA MOTTE in Missouri is an example of the profitable application of re-grinding. The dump is supposed to contain one million tons; it took 27 years in the making. The ore used to go through jaw-breakers before being crushed to eight-mesh by the old-fashioned friction rolls, without subsequent sizing and return treatment. In the mill recently erected, the dump material is re-ground with modern geared rolls, the product passing, after sizing, to Standard concentrating tables. Out of an assay-value of 72 cents per ton, there is a profit of 50 cents. The cost includes 15 cents for milling and 7 cents for smelting and refining of the galena concentrate. The mill treats 500 tons per day and it is to be doubled in capacity. Beside the lead, payment is now made for the cobalt and nickel, which formerly were disregarded in the smelter settlements.

JOPLIN, in Missouri, like Broken Hill, in New South Wales, is likely to have a dump re-treatment problem, as the existing mines become exhausted. In spite of the higher price for 'jack' or zinc-blende, which has nearly doubled in market value since 1901, there has been a decrease in the output; and though this has been slight, as yet, it is significant in itself as suggesting the approaching exhaustion of the large rich surface deposits of zinc ore. Notwithstanding the stimulus of a better metal market, the camp has fallen off in tonnage simply because the great superficial deposits, with their pockets of 5 to 20 per cent stuff, are largely worked out and the deeper mining in the sheet ground, with its three to four per cent ore, entails much higher costs of operation. The mining and milling is done for about one dollar per ton, which is good enough, but the extraction is only 60 to 70 per cent, so that big dumps have been accumulated such as will invite re-treatment. There are many hundred thousand tons of dump material that carry three per cent zinc sulphide. This is due in part to carelessness in handling rich stuff and in part to the crude milling process. The ore is crushed by jaw-breakers to ½ or ¾ inch before passing through rolls and into jigs. Tables are rarely used for re-treating slime. Facts such as these will warn those about to exploit the Broken Hill dumps with new processes, that there are other localities also which stand ready to swamp the market with their production of zinc.

Pyrite Smelting.

All practicing metallurgists will feel indebted to Mr. Lewis T. Wright for his clear treatment of the fundamental problems pertaining to pyrite smelting in its true form, that is, without adding to the furnace burden in carbonaceous fuel. While several writers have given valuable information regarding the cost of pyrite smelting, especially in a recent discussion on this subject, no individual metallurgist has contributed results based upon such laborious research, and developing scientific information of such immediate practical use. Pyrite smelting will always have its limitations, as Mr. Wright points out in his statements concerning the sulphur and iron percentage, and their ratio. The data covering the amount of oxygen required for the oxidation of pyrite to SO_2 and FeO is worthy of special notice, since it is only by a practical experiment that this point can be determined, although the quantity of air used and found necessary per square foot of hearth-area has never been brought so vividly to the notice of the average, practical smelterman as is done in the article mentioned. That hot blast is a decided advantage is emphasized by the fact that it increases the temperature of the furnace at the tuyeres, thereby quickening the chemical reactions that are taking place between the sulphur, the iron and the silica, giving greater speed to the furnace. Mr. Wright recognizes that speed is essential in pyrite smelting; and he, in common with most metallurgists, complains only of the mechanical imperfections of his application of the process.

We hope that other metallurgists will follow the lead of Mr. Wright and give similar information based on each man's particular experience, to the advancement of the science of modern smelting and the benefit of the mining industry. Such articles as this of Mr. Wright and that recently donated by Mr. E. P. Mathewson are of benefit not only to the metallurgist but also to the mining investor, for they give the information that may make for success in operations, the financial importance of which comes home even to people who have no interest in the relation of FeO to SO_2.

Re-Grinding.

It is likely that the tube-mill and the Chilean mill will be close rivals as devices for re-grinding the product of the stamp-mill. At Johannesburg, for instance, among other installations of tube-mills, two 18-ft. tubes have just been erected at the Ferreira mill; one of these was started running on January 11. This mill is re-grinding the spitzluten discharge from a 120-stamp mill that is crushing through a 22-mesh light screen and giving a duty of about six tons per stamp per 24 hours. About 250 tons of product per day is passing through the tube-mill. After leaving the tube-mill, the pulp passes over four shaking amalgamated plates, where about 60 ounces of amalgam per day are caught from the daily scrapes and from black sand caught on the plates. Before starting the tube-mill, the custom was to collect from the spitzkasten about 10 per cent of concentrate averaging 14 dwt. per ton. This was given a three weeks' treatment with cyanide, which brought the gold in the residue down to about 2.5 dwt. Now only two products are being made: Sand, representing 70 per cent of the mill-tonnage, and slime representing 30 per cent. The total residue from the company's works before starting tube-mills averaged 1.06 dwt., now they have come down to 0.6 dwt., and the manager expects to do better. The following figures in the use of shaking amalgamated plates in this mill during 1905 will be of interest: There are 24 of these plates running below the ordinary fixed plates at the batteries; during the year there was collected from these plates 16,028 ounces of amalgam; 78 per cent

of this total was recovered from dressing the plates and 22 per cent from steaming them; the total fine gold obtained was 4,808 ounces, valued at $97,941, less cost of running and maintenance of plates, namely, $5,683; that is, $92,258 represents additional profit to the mill.

In Mexico, a Chilean mill fed with a product that had passed a 2½-inch grizzly, reduced 18 tons per day at one operation, so that 20 per cent was between 100-mesh and 200-mesh fineness, while over 77 per cent passed 200-mesh. With a 10 to 1 dilution and a consumption of 12 horsepower, this mill ran for 18 months without stopping for repairs. It cost $4,000 at Pachuca and did the work described for 23 cents per ton. Chilean mills have long been in use at Pachuca, for they are legitimate descendants of the *arrastre;* nevertheless, even the Spanish engineers at that ancient mining center are using Abbé tube-mills, so that it is evident that we should soon be in possession of valuable data, secured by making trustworthy tests between the various machines employed for re-grinding.

The Coal Strike.

As we go to press, the trouble in the bituminous regions appears likely to be adjusted peaceably, but the conditions in the anthracite region of Pennsylvania are less hopeful. One reason is the plain lack of truth. There is a lot of insincerity in the arguments of both sides and the intelligent portion of the public, who is to suffer for it, is entitled to protest. For instance, Mr. David Willcox, of the Delaware & Hudson Company, and chief spokesman lately for the coal operators, denies the existence of a combination among them, which, while it may be technically true, is a manifest evasion of fact. This same representative of the operators publishes figures to show that, since 1902, the cost of mining and preparing anthracite has increased 66.68 cents per ton, or 53.6 per cent; the receipts have increased 54.42 cents per ton, or 17.5 per cent, while the balance of profit is only 12.26 cents, or 5.7 per cent more. Such statements are misleading — intentionally, of course. Mr. Willcox is silent in regard to the cost of transportation, the fact being that the profit appears on the balance sheets of the railroad companies that control the coal mines; as is reflected vividly by the stock market, for since the formation of the coal trust the shares of the Reading railway have risen from $19.50 in 1899 and $24.50 in 1901, to a maximum of $164 this year, and Lackawanna has soared from $157 and $188.25, in the years quoted, to $474.75 in 1906. The operators come before the public with a straight face and say that the price of coal at $4.87 at tidewater only yields them a narrow margin of profit, but the coal-carrying railroads, which they also control, are making money hand over fist. The railroads own or control 96 per cent of the anthracite deposits, 91 per cent being actually owned by the transportation companies. Moreover, anthracite is a natural monopoly, for outside of Pennsylvania the only known deposits of economic value are in Colorado and New Mexico, and these are of little importance, save locally. The entire source of supply is confined to nine counties in the State of Pennsylvania, the area occupied being 496 square miles. Of the nine counties, five produce 96 per cent of the entire output. The anthracite coal trust is a fact.

As an example of evasion, it is to be noted that Mr. Willcox makes no mention of small coal, which increased from 10 per cent of the output in 1890 to over 35 per cent in 1905. In 1890 a large proportion of this small coal, and in earlier years all of it, was discarded as waste; whatever is now sold is clear gain to the production; it is this small stuff that competes with bituminous coal and brings the price of anthracite down to an average that apparently shows no great increase. But the figures of tonnage tell the story. In 1890 the production of anthracite was 36,615,459 tons; in 1905 it was 75,501,503 tons.

Nor, on the other side, is Mr. John Mitchell any more reliable than the spokesman for the 'coal barons'; he is not even as representative as he claims to be. The majority of the members of the United Mine Workers are employed in bituminous coal mining; the membership is composed of employees in competing industries and engaged in more than thirty different trades and occupations; the local unions are numerically controlled by the votes of young boys, who constitute 20 per cent of the membership in the anthracite region. The big strike of 1902 was settled by the vote of a small majority of delegates; out of 811, there were 461 in favor of a strike, that is, 57 per cent only. In 1900, with a membership of five per cent of the anthracite miners, the United Mine Workers forced a disastrous strike. They now demand a uniform rate of wages, for every kind of workman, hiding the fact that this would mean a revolution; the engineer who runs a winch is to receive the same pay as the man who has a giant Corliss in his charge; it means an increase of 150 per cent in the wages of some men, and a general increase for outside men of nearly 30 per cent. Mitchell asks the anthracite operators to collect dues for his organization—for men, the majority of whom are engaged in mining bituminous coal, which is sold in competition with anthracite. He talks about a lack of contentment among men who receive unequal wages. Well, most everyone of us receives rewards and wages different in kind and amount to those that his neighbor gets, and we do not propose to turn the world upside down for that reason; a proper amount of discontent is a great spur to honorable effort. Diverse work has won different pay since the world began. Finally, as to the eight-hour day, he knows well enough that the owners of mines are willing to pay for eight hours' actual work; the Strike Commission found that under the ten-hour rule the men worked from six to nine hours, averaging about eight hours; and everybody knows that the quality and difficulty of work are factors that this time element ignores. When he comes to the demand for a recognition of his Union, he has some justice on his side; the operators are combined; they act as one. Why not the workers? The main argument that the operators can bring against the Union is that it is not completely representative and it covers the operations of a rival industry; but if the anthracite miners as a body will form an organization of their own, leaving out the bituminous districts, and if, without using threats or force, they can make their Union really representative, then the operators will have no such argument, for they have a combination which is thoroughly representative and which acts as a unit in all trade disputes. The public cannot object to such organization on either side, so long as each is held responsible for its acts, and these acts do not transgress the laws, or the intent of them.

The cry against the 'closed shop' comes with cynical humor from the mouths of the coal operators, who themselves maintain a tightly closed shop. Not only do they control the coal roads and the coal mines, but they regulate the output of anthracite to a nicety, the production being such as to enable them to get the uttermost penny out of the consumer. The public has a right to resent their championship of the 'open shop' when the operators themselves are among the worst exemplars of this form of tyranny. Certainly the dwellers in the large cities of the Atlantic seaboard know by this time how they are victimized by the coal monopoly. A pretence is made that the price paid for anthracite to the mine operators is moderate and that it is the retail dealers who rob the people. The operators are not responsible for the doings of the dealers, so they say. This is theatrically speaking. There is a retail coal-dealers' association, every member of which makes such local prices as are dictated by the association, in turn dominated by the trust; a limited membership is maintained so as to keep the business nicely adjusted. Hence the householder pays from six to seven dollars per ton when the operators are talking about anthracite being delivered at New York tidewater for $4.87. The 'open shop' is a fine phrase, but it becomes ridiculous when used by Mr. Baer, Mr. Willcox, and their associates.

It comes to this, the public is to suffer by these contests between the operators and the miners; whichever wins, the loss will be made good out of the pockets of the people and in any event the country suffers irremediable injury. Both parties have prospered during recent years; neither side merits any sympathy. The preliminary skirmishes have indicated a desire to fool the public and a hope of saddling the other side with the blame of a strike. There is no need for one. The questions at issue are largely those of fact such as can be settled by impartial investigation.

By the Way.

In a recent issue of the *Popular Science Monthly*, Mr. Alfred H. Brooks, of the United States Geological Survey, gave an interesting summary of the work done by himself and his colleagues. He says:

A decade ago the United States Geological Survey began its work in Alaska by sending a party of only three men to the Territory, whereas in the past summer 12 parties, with an aggregate membership of 50 odd men, were there engaged in geologic surveys. Even this rapid expansion is hardly commensurate with the size of the Territory and the importance of the mineral resources, the development of which the geologic investigations aim to aid. Alaska's 600,000 square miles are much spread out, stretching to a width of 2,400 miles and to the north and south length of 1,100 miles. Were this vast area, which is equal to two and a half times that of Texas, the cold, barren waste so often pictured it would be of small practical import as to when it should be surveyed. But Alaska has large and constantly growing mining interests, and it is the demand of these which has influenced Congress to increase the appropriation for geologic surveys from $5,000 in 1895 to $80,000 in 1905.

Even the present appropriation is less than 1% of the annual gold production, which has increased from $1,866,645 in 1895 to $9,300,000 in 1904, and is far from having reached its maximum. Nor does the gold production tell the whole story; the value of the copper and silver annually mined now exceeds half a million dollars, and the output of the former is rapidly increasing. There is in Alaska also some coal mining, though this industry has not yet attained its rightful importance. The Territory contains some very valuable bituminous coal fields. Prospective mineral wealth also lies in Alaska's tin ores, oil fields and gypsum beds, which have all been sufficiently exploited to indicate their probable commercial importance. The time will come when iron and zinc ores are mined in Alaska, and its immense granite areas will yield building stone to the Pacific coast.

Applied geology touches the activities of mankind at many places, but primarily, of course, in the vocation of mining. It is on the basis of geologic knowledge that soils must be classified, and this, in turn, together with the topography, determines the distribution of animal and vegetable life. In the Alaskan work of the Geological Survey, practically only the needs of the miner have to be considered. The agricultural and allied interests of the Territory are being investigated by other governmental bureaus.

The attitude of the public toward the science of applied geology has so materially changed during the last decade that its practical value is now generally recognized, though a few still remain skeptical as to the commercial importance of the results. This attitude exists partly because geology (not being an exact science) has often been brought into disrepute by dilettantism, if not downright charlatanism. Among technicians, however, it has become generally accepted that with the increase of geologic knowledge of a given region comes a decrease of the element of chance in the discovery of orebodies.

The intelligent prospector has learned that even at best his chance of success is small; but is much increased by a knowledge of the geology of a region he intends to explore. With a better understanding of the laws which govern the occurrence, origin and distribution of mineral deposits the old-fashioned, picturesque haphazard prospector, to whom it must be admitted we owe the discovery of most of our mineral wealth, will disappear, and the technician will take his place. This is probably the last field where the specialist will crowd out the man of purely practical training; but it is a substitution bound to take place in time.

A geologic survey has two objects: first, the increase of scientific knowledge, and, second, the application of this knowledge to the mining industry. The purely scientific investigations include many subdivisions and ramifications that cannot here be considered, but it will be evident, even to the layman, that, while any part of the earth's surface remains geologically unmapped, there will be a hiatus in our knowledge, which may prevent broad generalizations.

In Alaska special attention has been given to the second field of activity, namely, the application of geology to the needs of the miner. This is in part the influence of the growth of economic work in both State and Federal surveys during the last decade, but more specially because the appropriation is specifically made for the investigation of the mineral resources of Alaska. With this end in view, a score of publications dealing with the occurrence and distribution of the mineral deposits of the Territory have been issued. It has been the policy to make public the results attained while yet the investigation is in progress, in the belief that even an incomplete knowledge of the geology would be of value to the miner. With this end in view, bulletins treating of the occurrence of coal, petroleum, tin and copper have been issued, as well as many which are devoted to the gold deposits. These preliminary reports have found favor with the mining public because of their timely appearance, and have forestalled criticism of delay in issuing the more elaborate treatises.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

A BARREL of crude petroleum usually means a barrel of 42 gallons. One of refined oil, kerosene, means a barrel of 50 gallons.

MOST wire gauges are inaccurate owing to the high cost of accurate gauges, the price of which makes them almost unsalable.

A CARLOAD of ore is indefinite. It may mean, on the railroad, from 1 to 40 tons. Ordinarily, however, 20 tons is considered a carload.

THE specific gravity of steel is slightly higher than that of iron, being 7.854 for steel and 7.7 for iron—about 2% more for steel than for iron.

TAILING which runs upon the land of another may be claimed by the owner of the land, or he may recover damages if injured by the presence of it.

FROM 15 to 20 tons of broken rock is a fair shift's work for a mucker underground. Some, though few, may do more. It depends whether it is day's pay or contract.

AMMONIA is an antidote for many poisons, such as snake virus, etc., and also to some extent for cyanide poisoning if taken promptly. For the latter, hydrogen peroxide is better.

STAMPS weighing 1,000 lb. or more should be provided with correspondingly heavy mortars, and solid foundations superior to those which are considered sufficient for lighter stamps.

IN SPEAKING of units when referred to the occurrence of copper, lead, zinc, etc., it means 1% or 20 lb. in each ton of ore. Thus a unit of copper is worth at present New York price, about $3.75.

MINE WORKINGS can be ventilated by means of compressed air, but it is more expensive than to install proper ventilating pipes of liberal dimensions and good-sized rotary ventilating fans.

THE yellow mineral carnotite is quoted in New York at $8 to $10 per unit of uranium oxide, it containing 3 % or more. High lime content, or copper in the ore, is penalized. The presence of vanadium is an advantage.

AN AIR COMPRESSOR theoretically works up to its full capacity at sea level. There is a loss in efficiency, however, with increase in altitude. At 10,000 ft. above sea level there is a loss of 30% and at 15,000 ft. of 42 per cent.

THE Homestake Company of Lead, South Dakota, is working 1,000 stamps, each weighing 850 lb. or more. These stamps are distributed in six mills. The largest number of stamps in any of these mills is 240, the least number is 100.

ZIRKEL describes felsitic groundmass as amorphous, in thin section showing no independent contours. Its true nature is variable and not easily described. Felsite is generally considered as an intimate mixture of quartz and orthoclase.

MINING claims located prior to May 10, 1872, did not require parallel end lines to secure the extra-lateral right, but in all claims located since that date parallel end lines were necessary to the enjoyment of the extra-lateral-right privilege.

MANY engineers prefer inverting to erecting telescopes on their surveying instruments, as the former generally afford more light and a clearer, more distinct image of the object. The power of telescopes is determined by the number of diameters it will magnify.

MANY common minerals are the result of alteration, by metamorphism or otherwise, of other minerals. One of the most common minerals resulting from metamorphism is garnet. It occurs in various colors—green, pink, brown, violet, purple and black.

AS FAR as known to 'Concentrates,' there is no book published on pocket-hunting alone. Most of the prospector's field-books, etc., contain a great deal of miscellaneous information which is useful to the prospector, but few or none of them make a specialty of any subject

HOLES may be drilled by hand by means of the jumper or churn-drill to a depth of 20 ft. or more, depending on the weight of the steel. A 1½-in. pipe with drill bits welded onto the ends makes a good churn drill, being sufficiently strong and much lighter than a bar of solid inch steel.

BEFORE constructing a windlass, determine how deep the shaft is to be sunk with the outfit and then build accordingly, aiming to so manage the winding drum that the rope will not wind back upon itself, and also, see to it that the bucket can be raised above the platform without interference. Nothing is so secure on a windlass as some form of safety hook, that must be unlatched each time in order to detach the bucket from the rope.

MANY well-regulated mines where cages are used in the shaft have steel plates on the floor of station in place of the rails, cars from the drifts and crosscuts centering at the station being run upon the plate from the tracks. Near the shaft are flaring guide-rails to direct the car onto the cage.

MONAZITE is probably of more wide-spread occurrence than is generally supposed, but is not recognized by miners. It is a grayish mineral of resinous luster, and high specific gravity, hanging back in the pan like sulphides, gold and other heavy minerals. It occurs in granitic rocks and in areas of schists.

THE cost of transporting ore by wire-rope may, like all other kinds of transportation, depend upon conditions—whether power is required or not, the distance between terminals, etc. The longest aerial tramway in the United States is that of the Penn-Wyoming Copper Co. at Encampment, Wyoming, 16 miles long.

IT is impossible to pre-estimate the amount of water which may be developed in a mine. The first 100 ft. of shaft, or the first 500 ft., do not form a safe index of what may be found at greater depth. The amount of water encountered in a neighboring mine is a better and safer index, though even this is not always reliable.

POTASSIUM CHLORIDE, like sodium chloride, occurs in nature but is much less abundant. It is found at the salt mines of Strassfurt, Germany, overlying a great bed of rock salt, which it resembles. This natural potassium chloride is called carnallite. It is very deliquescent, and readily soluble in water, though insoluble in alcohol.

IN making a test run in a custom mill it is bad practice to clean up after a run of rich rock with rubbers, and immediately after clean-up a run of low-grade ore with steel chisels. The results, particularly of the latter, are likely to prove deceptive. Steel chisels are bad for mill plates at all times, but more certainly so on low-grade ore.

A VERNIER SCALE is a small movable auxiliary scale attached to a fixed scale and which is divided into a number of equal parts, either one more or one less than an equal distance on the fixed scale. The position of one end between two scale marks is indicated by the coincidence of one of its scale marks with the mark of the fixed scale.

WATER boils at sea level at 212° F. With increasing altitude the boiling point becomes lower, until at a sufficiently high altitude the hand can be immersed in boiling water without injury. This fact is sometimes employed in determining altitude, but like the barometer, many corrections have to be made to arrive at the correct result.

THE owner of a mining ditch is responsible for damage resulting from washouts. It is his business to see to it that his ditch and flume are in good condition. An 'act of God,' such as a washout due to a storm, does not render the ditch owner free from responsibility for damages sustained by another from the overflow of his ditch at such a time.

GYPSUM is a non-conductor of heat, which property is frequently made use of in the manufacture of articles which are likely to be exposed to high heat, with a view to prevent damage therefrom. Gypsum is used as a lining in fireproof safes. It is said to be almost impossible to boil water in a kettle, the bottom of which is covered with gypsum.

AN INSTANCE has been recorded of a cyanide vat which had been in use constantly for four years, and which by assay of auger borings from the bottom of the tank returned $13 per ton of wood, an amount scarcely worth consideration when contemplating the difference between assay of ore treated and the results actually obtained by the cyanide process.

PLACER GOLD becomes higher in grade with distance from its source. This is a fact demonstrable in many gold camps. The gold in placers is almost invariably of greater fineness than that in the veins from which it came. In the veins the gold is usually alloyed with silver, but the proportion of silver appears to decrease as distance from the source increases.

A SINGLE one of several co-owners of an unpatented mine on which assessment work remains unformed, can not re-locate the claim in his own name to the exclusion of his partners. He must himself perform or cause to be performed the assessment work, and then 'advertise his delinquent partners out,' as required by law. The statute is very clear on this subject.

ONE fully acquainted with the matte produced by a certain smelter may be able to tell, within a few per cent, what the copper content of the matte is. To do this he should know whether or not the matte contains any lead. A stranger would find difficulty, perhaps, in doing this, but could acquire the ability to do so when he became familiar with that particular matte.

MINERS sometimes mistake clay for talc. White earthy minerals are often difficult of determination. It is often hard to distinguish between talc and serpentine when the latter is schistose, particularly in the field. Serpentine is distinguished from pyrophyllite and talc by its complete decomposition in sulphuric acid, pyrophyllite being only partly decomposed and talc not at all.

THE analysis of a good molding sand will give results within the following limits: Total silica, 75 to 85%; alumina, 7 to 10%; lime, below 2%; alkalies, below 0.5%; oxide of iron, below 6%. The total percentage of iron oxide, lime and alkalies or the total fluxing agencies should not ordinarily exceed 7% in one sample. In a high-grade molding sand used for heavy work they should not exceed 5 to 6 per cent.

A GASH VEIN is one having no great downward continuity. They are probably the result of torsion of the rocks in which they occur, being filled possibly from the walls, or more probably from below by solutions passing along very small fissures—mere cracks. Gash veins occasionally carry high-grade ores, but are not reliable. Several rich veins of this type occurred in the Vanderbilt district of San Bernardino Co., and in the Piñon Mountain district in Riverside Co., California.

PURE calcium chloride may be obtained by dissolving pure calcium carbonate (Iceland spar) in hydrochloric acid, and evaporating the solution. Ordinary chloride of lime (bleaching powder) is made by passing chlorine gas into boxes of stone or lead on the bottoms of which a quantity of moist slaked lime is spread out. The temperature is not permitted to rise above 77° F., by introducing air with the chlorine. The lime absorbs nearly half its weight of chlorine and forms a white powder, which has a peculiar pungent odor, though somewhat different from the chlorine.

THE number of rods of ditch a man can dig in a day depends wholly upon the situation and character of material to be handled. He will, for instance, make better headway on a hillside ditch than he would make in digging a trench of the same cross-section area in a flat, where only earth and loam are to be removed. If trees, brush and roots interfere, even though they be cut away from the surface by the axmen, progress will be slow. The frequent occurrence of large burred rocks also makes considerable difference in what may be accomplished in a day's work.

MILL SCREENS of too great thickness retard the discharge of pulp, those too thin break easily, causing annoyance and loss. The millman should seek a material which will give him the desired firmness, and at the same time lasting qualities and reasonable capacity. It is cheaper to employ a screen giving as large capacity as possible while at the same time doing good work in amalgamating. Too coarse crushing usually leaves too much gold in the tailing, while too fine crushing creates slime which may render subsequent treatment difficult, but on the whole there is an increasing tendency toward finer crushing.

SULPHIDE GOLD ORES cannot be treated by chlorination without roasting for the reason that the chlorine gas does not attack the gold in the sulphide with sufficient rapidity to make the process commercially successful. Some gold-bearing pyrite has been treated raw by cyanidation but for some unknown reason all pyrite is not equally amenable to treatment by this process. When raw sulphide is treated the material must be finely ground—200 mesh at least, and agitation practiced. As high as 97% extraction has been claimed for certain ores treated in this manner. It is customary to roast sulphides prior to cyanide treatment.

IF the Cameron pump was working successfully with compressed air it would give an efficiency of from 12½ to 17% depending upon the condition of the pump and the ratio of the cylinders. If the pump was successfully working with steam under the same conditions, it would probably give 50 % efficiency. Inasmuch as the proportion of the mixture of air and steam is unknown, it would be impossible to give the exact efficiency of this pump, but it will lie somewhere between 12½ and 50 %. If simply enough steam was injected to keep the temperature up to 300° the efficiency would probably be about 25 %, and the efficiency would increase above this point in proportion to the increase of the steam mixture over the air.

FOLLOWING are the charges made by the Government land-offices for mineral surveys, as per paragraph 3 of the General Land Office circular of the United States mining laws: For lode claim, $30; for placer claim, $35; for millsite, $30; for millsite, included in one survey with a lode claim, $20; for each lode claim within and included in the survey of a placer claim, $20; for several lode locations included in one survey, the first location named, $30; all other locations included, each, $25; for several placer locations included in one survey, the first location named, $35; all other locations included, each, $30; for affidavit of $500 expenditure of improvements, after approval of survey, $5. Should an amended order issue, an additional deposit will be required.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—The discussion on this subject, begun in your issue of February 24, has proved very interesting, but so much has already been published upon the subject that there seems but little more to be said, except in a general way.

The consensus of opinion favors the rectangular shaft of three or more compartments, and with this opinion I heartily agree, that is, where a large tonnage is expected to be hoisted daily, and a large amount of water is to be handled. For such work, I strongly favor the three-compartment shaft with the hoist-ways 4½ by 4½ ft. within timbers and the pump and ladder-way compartment 4½ by 5 ft. As is well known, a great deal of money has been spent and frequently wasted in trying to utilize old shafts, and old machinery, when they are not of the shape and power required for the work to be done. Take the case cited by Mr. R. H. Burrows: Considering the work expected to be done through the shaft, that is, 1,000 tons per day, it would, in my opinion, be far more preferable to abandon a portion of the 10 by 10-ft. shaft and stope up the third compartment, making the excavation for the shaft outside of the timbers 6½ by 19 ft., which would leave a portion of the 10 by 10-ft. shaft, 3½ by 10 ft., that would not be utilized. As the wall-rock is so firm, all that would be necessary to make the timbering strong and secure would be a brace 3½ ft. long from the center brace of one compartment to the wall of the old shaft, or, if the wall-rock should be shattered, this space could be filled with the ground broken in stoping up the third compartment. The excavation of 6½ by 19 ft. would permit the use of 10-in. by 10 in. timbers for wall-plates and center-braces, and while it is claimed that the rock is sufficiently firm to dispense with the use of wall-plates, still, considering the difficulty in placing the center-braces, or dividers, so that everything would be in perfect alignment, it is probable that the extra labor employed in doing this would just about offset the cost of timber. In the sinking of a shaft to a depth of 2,300 ft., unless it is a well proved district, it is impossible to tell what ground would be passed through, or in other words, heavy ground might be encountered at any time, which would compel the use of heavier timbers. For this reason, I would advise the using of filling, or distance-pieces, between the center-braces and the guides. These distance-pieces should be at least two inches thick and the full depth of the center-brace, with the guides lag-screwed through these filling pieces into the center-braces. This answers two purposes: First, it gives four inches leeway to keep the shaft in alignment, and secondly, if heavier ground should be encountered, it will permit the use of heavier center-braces, or dividers, to withstand the pressure of the ground. Of course, in heavier ground, more room can always be made for the wall-plates and end-timbers should it be necessary to use heavier timbers.

This plan would entirely cut out the 'jog' in the shaft, which would certainly be a "thorn in the flesh" to the management, as it would at times cause more or less trouble or delay in the regular hoisting and pumping work; and where such a large tonnage is to be handled, the saving of time that would naturally be lost owing to the jog, would more than pay for the work outlined to cut out the third compartment in the old shaft. This plan would also save a great deal of wear and tear on the tempers of the management and employees.

With such a shaft equipped with skips that will carry five tons of ore, and with large ore pockets, provided with chutes, at the several stations of the mine, the hoisting of 1,000 tons per day would be a comparatively easy matter, for the capacity of such a shaft is practically limited only by the power of the hoisting engines.

For the handling of timbers and men, a 16-ft. steel cage could be hung under the ore-skip. For handling timbers, this cage would take a 16-ft. stick if necessary, which could be readily handled at the stations, and when it came to handling men, a 'false' steel deck could be put into the middle of the cage, making a double-decked cage of it, and with the men that could be placed in and on top of the skip, it would be easy to carry 30 men at a trip, which would consume but little time in the handling of the crew.

In the third compartment would be the ventilating air-pipe, compressed-air pipe, pump-column and electrical wiring, also a ladder-way with platforms at every third set. This compartment would permit of the use of a service cage, run by a separate hoist, for the handling of pipes, pumps and pumpmen, should it be necessary, and as it would not be in use all of the time, the additional cost would be slight.

Fig. 2.

It would also be well to have two large bailing-tanks from 1,200 to 1,500 gal. each, which could be swung into the hoisting-compartment and hung under the skip in case of an accident to the pumps, or if there were a heavy flow of water to be cared for, the mine could be kept dry by combined pumping and bailing.

The cost of such a shaft varies so much in different regions, that but little can be said under this head, as it is entirely governed by local conditions as to price of labor, timber and supplies, but in average hard rock, such as metamorphic greenstone tuffs, the excavation 6½ by 19 ft. could be easily made with an average of 18 holes to the round, six holes for the cut in the center of the shaft, and six holes on each end of the cut. We have broken such ground in an excavation 8 ft. by 20 ft. with the same average number of holes to the round, that is, 18, and where the timbers cost $7.52 per foot of shaft, and the cost was brought down as low as $40 per foot, with the use of machine-drills; but this is less than the average cost of sinking a vertical shaft along the Mother Lode of California.

While economy in every part of the mining business has been reduced almost to a science in this part of California, a fact chargeable largely to the low grade of ore to be handled, it is generally conceded that the first cost of a large shaft and the proper equipment of it should not be considered so much as the benefit and economy in operation that would be obtained from having the best shaft and equipment possible, for where such a large tonnage is to be handled, the saving of a few cents per ton will very soon pay for a great deal of equipment.

JOHN ROSS, JR.

Sutter Creek, California, March 20, 1906.

Fig. 1.

BUILT-UP TIMBERS.

The Editor:

Sir—In 'Concentrates' for the issue of February 17, I note the statement that "Where large square timbers are not available for constructive purposes, timbers may be built up by spiking boards or planks together." It is well added that such a timber is no stronger than a solid timber.

Prof. Edgar Kidwell, in a series of tests recorded in Vol. XXVII, *Trans.* A. I. M. E., showed that built-up beams, when extremely well constructed, had an efficiency of but 60 to 80% that of the solid beam, and these were all keyed or bolted together. I am not a mechanical engineer, but from examples seen in a mill I once had occasion to visit, I doubt if the spiked built-up beam can be depended upon for even 50% efficiency where rigidity is an object, as for example in carrying a line of shafting. Photograph No. 1 shows at the top a built-up 10 by 10-in. timber (A), composed of five planks placed side by side and spiked together, the broken joints between each line of plank coming about three feet apart. This line of timbers was used to carry a small line of shafting, not over 1 15/16 in., I think, transmitting possibly 10 h.p., and as the supports were only 16 ft. apart, with braces to help out three feet on each side of this, it is evident that a solid timber would have given little deflection, if of this size. The result, with this timber, has been a deflection of several inches, and an opening, the shape of an inverted V, has formed at each joint of the 2 by 10, giving a series of points sticking down below the line of the timber. These do not show in the photograph, but a good idea of the amount of the deflection may be had by placing the side of a sheet of paper, or other straight-edge, along the line of the timber in the picture. Undoubtedly the timber should have been built up by placing the plank, one on top of another, in place of side by side, but most substitutes are made wrong at first. What use the longitudinal timber (B) is intended to serve is a question. It is simply bolted to the line of transverse timbers, probably on the principle that "In union there is strength," though it only adds so much more weight. The idea of the truss, presuming the shaft could not have been carried otherwise, was evidently not considered.

Photograph No. 2 shows a post similarly built up which has failed to do the duty expected of it. However, these things serve a purpose in leading to the successes which are "attained through manifold struggles and defeats." No. 1, in the black oil spots on the floor below, and on the timbers, which make the shaft indistinguishable, shows the efforts to keep the bearings cool. It hardly needed the statement of the foreman that the shaft broke often to convince me that this built-up timber had not been a success.

Along the line of failures leading to success may be noticed the housing of the two elevators in No. 2, which was built of green lumber, with the result that after the elevators had been used for a few months for dry, hot material, the slime was all over the mill in the form of dust. The next housing of tongued and grooved material will do better.

GEORGE A. PACKARD.

Boston, March 1, 1906.

THE FIRST WRITER UPON MINES.

The Editor:

Sir—I was interested in the good things in an article appearing in your issue of March 10, 1906, under the above caption; but I shall have to take issue with the idea that Job was "the earliest known writer upon mines." The Creator, in making the home of our first parents, was aware that it would never be a paradise for man without a gold mine. So we are told by the author of Genesis (see Chap. 2: v. 11 and 12) that on one of the forks that watered the Garden of Eden "there is gold. And the gold of that land is good." In other words, it was gold of good quality, over 900 fine. According to the accepted biblical chronology, this mention is 2,500 years before Job. While there are many references in sacred history which go to show that the precious metals, gem stones and shells were valued and used from the earliest dates to which we may trace back,

there is little reference to the mines themselves and to mining operations. We read that "Abram was very rich in cattle, in silver and in gold." We have the best of reasons for believing that gold and silver were used as mediums of exchange, by weight, at the time of Abraham, 1,800 years before Christ.

In profane history, the excavations and interpretations of ancient records in Egypt tell us that "the quartz veins of the granite mountains along the Red Sea were rich in gold." We learn of extensive mining operations in Nubia and that large numbers of miners were employed at Sinai at the accession of Menes to the throne of Egypt, 3,400 B. C. (See 'A History of Egypt,' by Breasted.) A recent article in *Harper's Monthly* (February, 1906), has a picture of a "part of a tablet of a mining record, with names of 100 miners, 2,500 B. C."; and the writer, W. M. Flinders-Petrie, says, in speaking of discovered tablets at Sinai: "Each king who ordered an expedition had his name and the account of his work carved over his mine. Thus are found Sanekht and Leser of the third dynasty and many others down to the eighteenth dynasty, showing that the mines were worked from about 4,500 to 1,500 B. C." This would indicate that "the earliest known writer upon mines" was an Egyptian, antedating Job by 3,000 years.

MATT. W. ALDERSON.

Helena, Montana, March 13, 1906.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—So far as this discussion goes, the old Mexican shaft is an embarrassment, as very frequently indeed old shafts prove themselves to be; without it, or with the whole surface eroded down to the 320-ft. horizon, we could fairly take up the broad question of the best shape for a shaft, and thresh it out until opinions were harmonized, or proved hopelessly divergent. As it is, however, and to make the best of a bad case, the question shorn of all parasitic attachments is, how the Mexican shaft can best be adapted for the permanent works and what shape can best be adopted for the lower portion. This combination, it can be noted in passing, of adaptation and adoption affords an excellent illustration of the sort of problem constantly cropping up in every-day practice—the modification of the ideal to suit the needs of the particular case.

Considering, in the first place, the present shaft, there is no escape, to my mind, from the use of the whole of the old excavation or none of it, and so far as the latter alternative goes we must admit that the $10,000 to $20,000 it represents must not be lightly thrown away. For the assumed needs of the mine three compartments are necessary, and any other shape, involving the lengthening of one end of the 10-ft. square, so as to get the three in line, could not but be dangerous. If this were attempted, an angle of rock would be left between the new third compartment and the unused portion of the old shaft; this would be always an element of weakness, and, no matter how well the old shaft has stood, there would be constant menace of part of this sloughing off on some bedding or joint plane. At best this would throw unequal pressure on the timbers, resulting in trouble with alignment, guides, and pump-column; and at the worst, it would be a constant source of expense and delay for repairs. Nor could it be told to a certainty at the start, by the most painstaking inspection, whether this was likely to be the case, for the shattering during the course of the proposed endwise enlargement would alter the conditions. As to this point, I cannot think there would be any doubt, particularly when it is remembered that this angle of rock would be 320 ft. high and unsupported except by light timbers. In continuing this discussion, I accept Mr. Burrows' statement that no wall-plates are needed, though of course there must be dividing and end-pieces for the support of guides, etc.

It seems needless to discuss here whether two compartments can be constructed in an opening 10 ft. long, capable of raising 1,000 tons daily from a depth of 2,300 ft., for if 10 ft. will not suffice for two compartments, 12 ft. will, and the 10 by 10 shaft can be easily enlarged to a 10 by 12, by methods that bear about the same relation to sinking that stoping does to drifting. Accordingly, we simplify matters by assuming that a 10 by 5-ft. shaft will suffice for the needs of hoisting. I believe then that the square Mexican shaft can be adapted to the needs of the case for its 320 ft. of depth, and best on the lines suggested by Mr. Burrows, giving two hoisting-compartments five feet wide, with the center piece five feet from the ends. As above explained, this can easily and relatively cheaply be increased, should the needs of hoisting demand it. There are two alternatives in the methods of timbering to be used in this square shaft: the first would be 10-ft. end and dividing pieces, connected by posts; and for the second, sprags would be added between the center and the two ends, and gained into all three. These would be placed on the boundary line between the hoisting-compartments and the large pump and ladder-way. If the walls are really as sound as supposed, it is not likely these will be demanded, but the posts will be essential for a first-class job, as they bind the sets—so called by courtesy—together and distribute to a number of timbers any strains, such as might be caused by a cage sticking on the guides or dropping on to the safety catches. Beside this, being all cut to gauge, they insure regular spacing of the cross-pieces and prevent any single timber, that may have become loosened, falling away from its place. I would say here, in passing, that I am far from favoring timbering a deep shaft other than by full-framed sets, because of this very point: if a block rots away or a wedge falls out, the full-framed shaft timber is merely loose; it is still held in place by post and girt, whereas, in the other case, it becomes an unsecured stull and falls or not, just as fortune favors.

Turning to the lower portion of the shaft, we are all familiar with the oblong shape, and probably the vote in its favor by any group of mining men would be overwhelming. Still it is always in order to go over the points and revise one's judgment, if necessary. The 10 by 10-ft. shaft will demand 25% more excavation than the 5 by 16-ft. shaft, a point that goes to the debit of the square shaft at the start, but possibly the lower shaft could be sunk 8 by 10 ft., or of the same area as the oblong shaft. If no sprags were used to separate the pump-compartment from the others, this would give a 3 by 10-ft. compartment for pump and ladder-way. This would certainly be ample, and enables us to compare the two proportions more surely. In a recent paper of the Institution of Mining & Metallurgy there is given a table from Mr. R M. Catlin's work in South Africa. Summarizing from this, we have in percentages of total time: drilling, 38%; winding rock, 41% (this must be taken as the equivalent of 'mucking'); winding men and tools, 15%; and blasting, 6%. These probably safe figures cut no ice so far as yardage goes, so that the whole question comes down to one of speed. In this, I think, the oblong shaft has the decided advantage. It is a common practice to sink in three-compartment shafts with two bars, two drills and two sets of drill-men. This results: in an immediate gain in speed, in placing the center-cut holes to better advantage and in making possible mucking-out one end of the shaft, setting-up one machine and then mucking-out the other end while drilling is in progress. In a 10-ft. shaft, I have not found this method possible; it results in too much crowding for good work. This argument seems to me paramount in favor of the 16 ft. shaft. If drilling and winding can be made to overlap, the 41% occupied in the latter, as per Mr. Catlin's figures, becomes far less formidable.

The joining of the pumping-compartment in the two portions of the shaft should be done by a gradual slide or spiral, the roof of which should be well timbered and blocked, to obviate any incipient motion. But this will be simple cap-and-post work, and far from difficult.

It cannot be claimed that the arrangement of shaft as favored would be ideal, but there is no question of its answering all calls upon it. In any case, in a modern shaft, pipe-columns would be handled through the hoist-way by the main engine, so that there would be no inconvenience entailed by the 'jog' design.

In closing, it will not be amiss to take up in order the points given by Mr. Burrows, as embodying the directors' view:

(1) As already stated, it would probably cost 25% more to sink the square shaft.

(2) The deeper cut could be made in the oblong shaft, and not the square as claimed, and the holes be placed at a more obtuse angle, therefore getting a better lifting effect.

(3) Shattering of the sides must be nearly proportional to the surface exposed; in the shafts these stand in the ratio of 42:40. This 5% increase of surface would be fully offset by the short ends and the ease of support of the sides in the long shaft.

(4) It is bad economy to have waste space, and a pump-compartment 5 by 10 ft. is much too large for ordinary needs.

(5) For hoisting above the capabilities of a three-compartment shaft, the problem becomes too complex for this off-hand discussion. The 10 by 16-ft shaft would be awkward in the extreme from the surface works to the underground stations and chutes; while the alternative of five compartments in line is open to the same objection I earlier raised as against altering the square shaft to three compartments in line. The only escape from this dilemma is on to the horns of a third, abandoning the Mexican shaft altogether. Any settlement of this involves other than mere engineering considerations.

R. GILMAN BROWN.

San Francisco, March 20, 1906.

CONCRETE piles of an unusual form have recently been tested in New York. They are made by spreading a layer of concrete on wire fabric to which longitudinal rods are attached at intervals. The fabric is immediately rolled up in a special machine of simple construction and the pile then laid aside to harden. It thus contains in addition to the fabric any desired number of vertical rods. In a cross section of the pile the fabric lies spirally from the inside to the exterior of the concrete. If so desired any one of the rods may be made a hollow tube, thus allowing for the use of the water jet process for sinking the pile.—*Iron Age.*

Job on Mining.

Written for the MINING AND SCIENTIFIC PRESS by R. W. RAYMOND.

The article entitled 'The First Writer on Mines,' published in the MINING AND SCIENTIFIC PRESS of March 10, is so highly ingenious and interesting as to warrant, perhaps, the suggestion of a somewhat different view, at which I arrived many years ago, as a result of a careful study of the text with the aid of the leading Hebrew scholar of this country—himself a member of the international committee which made the 'revised version' of the Old Testament.

The Book of Job, though dramatic in form, presents almost no action; and its artificial dialogue, in which each speaker takes his turn, is largely used as a thread upon which separate poems are strung. This is a well-known fashion in Oriental literature. The 'Arabian Nights' is one of numerous examples.

In Job these poems are often competitive—that is, Job produces a poem surpassing in sublimity those which have been recited by his interlocutors. The twenty-eighth chapter is such a competitive poem, the subject being 'Wisdom.' There is no good reason for the notion that the passages in this chapter, which refer to mining, are fragments of a longer document. The author is not undertaking to give a complete account of mining. He is simply illustrating the difficulty of discovering wisdom through mere search for it, by reference to the laborious search of the miner for gold and silver. Incidentally, he sketches for this purpose the two principal branches of mining, operated respectively on the surface and underground—his moral being that, while men take so much pains to discover and win valuable metals, 'Wisdom' cannot be found in that way. Additional particulars about mining were not necessary for that purpose; and their absence is evidence of the poet's artistic self-restraint, rather than of the fragmentary nature of the text as we have it. Indeed, the structure of the text almost precludes the hypothesis that it is incomplete.

In my present statement, the theological and philosophical bearings of Job's argument are intentionally ignored, and this poem on Wisdom is considered simply with regard to its direct descriptions or implications concerning the mining of the period when the work was written.

Correctly translated, and paraphrased in modern prose, the chapter reads as follows:

1. *Underground mining* (Described in the first eight verses).—Silver, gold needing to be refined (as distinguished from 'fine gold' or placer gold, which needed no subsequent treatment), iron-ores and brass-ores, are won underground. The miner presses to the very boundary of the darkness, and searches, to that limit, the rocks as dark as death. Down and away from human abodes he sinks his shaft, in which, forgotten by the feet that pass overhead, he swings suspended. Above him, the earth produces food; but underground, ploughed by fire, it has gems for grain, and gold for clods in the soil. His trail is invisible even to the keen-eyed birds of prey; nor has it ever been traveled by prowling beasts—even the bold lion, who goes fearlessly everywhere.

2. *Surface mining* (Described in the following three verses).—Again, the miner attacks the hard rock, overturning even the mountains by the roots, and cutting new channels, to lay bare the river-beds, in which his eye discovers every precious particle. He prevents the streams from leaking, and he brings forth the hidden treasure.

The rest of the poem declares that Wisdom can neither be won, as wealth is won by mining, nor even purchased with the products of human enterprise. The list of such things as cannot buy wisdom comprises: Gold; silver; gold of Ophir (apparently placer-gold of very high grade, possessing a special value); precious onyx and sapphire; gold wrought into cups; cups of crystal, ornamented with gold or coral; pearls; and Ethiopian topaz. Finally, it is declared that the price of wisdom cannot be "weighed with" (or valued with) pure gold; that is, it has no legal-tender standard of value.

The particular gems, especially the ruby, named in the King James version, must be accepted with some hesitation. The revisers suggest, instead of 'ruby,' either 'red coral' or 'pearls' Corals and pearls are quite appropriate to the poet's purpose, since they may be considered as the products of a sort of mining in the sea. Sapphires may also have been found in alluvial deposits then, as they have been found in the Montana placers. And it is not impossible that they might have been discovered in veins underground, as in the Jenks corundum mine of North Carolina. But it is highly improbable that this was then an important source of supply for them.

The foregoing paraphrase is justified in the main by either the text or the margin of the 'revised version.' Where it differs from both, it is based upon good authority. The chief defect of the King James version which it corrects is the absurd rendering of verse 4: "The flood breaketh out from the inhabitant; *even the waters* forgotten of the foot; they are dried up; they are gone away from men." This totally destroys the meaning and continuity of the poet's description, which the revised version measur-

ably restores. But both versions miss the magnificent contrast between the farmer's crops above and the agriculture of the miner below.

From the translation given above it appears:

1. That the author recognized the difference between underground and surface-mining.

2. That gold, silver, iron and 'brass' were obtained in his day by mining, followed by metallurgical treatment—doubtless a simple reduction by fusion with carbon.

3. That the relatively superior fineness of placer-gold was well known, and, consequently, that no 'refining' of gold, as it occurs in nature alloyed with silver, was practiced. The 'refining' of other gold was probably only a crude fusion of minerals containing free gold.

4. That underground mining was done by sinking shafts, in which the miners were suspended by ropes, and by running drifts "to the boundary of the darkness."

5. That the fracture and enrichment of the rocks underground were ascribed to volcanic causes, with the action of which, on the surface, all men were familiar. This, however, is not a scientific perception, deduction or prevision. It is simply a natural superstition.

6. That surface-mining had gone so far as to involve the diversion of streams into artificial channels, for the purpose of 'bar-mining.' Possibly verse 11 may indicate the employment of coffer-dams, to lay bare single auriferous bars, without diverting the whole stream. The whole description indicates the well-known capacity of the ancients for bestowing immense labor upon the execution of crude methods.

7. That coral, pearls, and sundry gems not to be positively identified, were recognized as objects of industry and commerce, and that their market value, as well as that of gold itself, was increased by the artistic work of lapidaries and jewelers.

8. That the commerce in such products was intercontinental, so that Ophir and Ethiopia were already trade-marks, indicating special quality and price.

9. That rock-crystal (not, in my judgment, glass, though this rendering is preferred by the revisers) was used in artistic jewellers' work, being carved and then adorned with coral, gold, etc. This is not evidence of an advanced state of the metallurgical art. Whatever could be done by simple patience and manual skill has been repeatedly done by primitive tribes, ignorant of the principles of the mechanical arts; and many achievements of such barbaric artificers have been simply the lucky outcome of experiments, involving a vast amount of unlucky and, therefore, rejected, results. Numerous instances of ancient art, offered as proof that the early peoples knew in some respects as much, and in other respects more, than we do, break down under this test. The modern art involves a knowledge of conditions and means, and consequent ability, to accomplish with certainty the end desired. In other words, its perfection is measured, in inverse proportion, by the number of 'rejections' which it incurs in practice. Thus estimated, I am convinced that the 'lost arts' of antiquity, concerning which so much has been rhetorically said, are not worth finding.

Further than I have gone in the above deductions, I do not think it safe to go. But another highly important question remains. Whatever may be fairly shown as to the existing state of mining and other arts by the twenty-eighth chapter of the Book of Job, what is the historic period thus illustrated?

Unquestionably, this book depicts a very ancient, patriarchal age. Yet it is almost equally certain that its theme, argument, and literary art, belong to a much later age. Without discussing the problem in detail, I may here observe that the most reasonable solution appears to leading scholars and critics to be that the drama was written at least as late as 750 B. C., though it describes the social conditions of a much earlier period. Its high literary art and structure favor this hypothesis, which is, *per se*, by no means unreasonable. Historians and poets habitually describe scenes and characters of ages long before their own. Nobody dreams that Homer was a contemporary of Achilles or Ulysses, or that the Bible story of Abraham was written in Abraham's time. There is, therefore, no inherent improbability in the notion that the author of Job clothed his relatively modern didactic message in the drapery of a patriarchal age, long past.

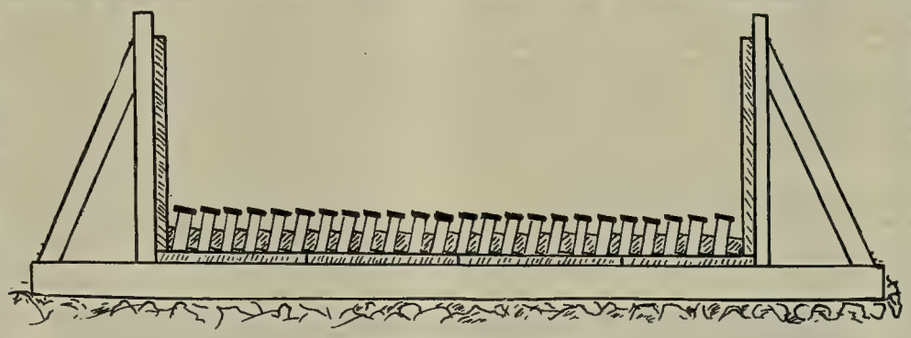
Such a literary artifice, however, cannot possess first-hand archæological authority. We do not adduce 'The Idyls of the King' as direct evidence of the customs of the period of the Round Table. We can only accept such works as second-hand authorities, valuable in proportion to the learning and care exhibited by their authors. The best of them are not wholly free from anachronisms. Even Thackeray's 'Esmond' is said to contain one word not used at the time of which it gives an otherwise perfect picture.

This test, applied to the Book of Job, reveals very few possible anachronisms—and most of these are doubtful. Its chief anachronism is international—namely, it places in the setting of a patriarchal age the discussion of problems which did not trouble the patriarchs; and it includes in this discussion conceptions and suggestions which belong to a much later and more complex state of society. But, aside from this pervading feature, it presents a wonderfully consistent and probable picture, in which, with our present critical apparatus, we can find almost no flaws.

Among these possible errors of the historical imagination, however, we must recognize the picture of mining, metallurgy, arts and commerce, given in the twenty-eighth chapter. In most other respects, the age of Job seems to be conceived as older, even, than the age of Abraham; and, since we now know, through the code of Hammurabi, that in the time of Abraham (say 2,500 B. C.) there was a settled and complex system of industry and law, we cannot positively declare that the poet's age of Job might not fairly present the features under consideration.

Nevertheless (for reasons which cannot be fully stated here), these features must be regarded as inconsistent, to some extent, with the extremely simple, nomadic civilization otherwise set forth, in great fullness of detail, by the Book of Job. At all events, we cannot, with positive certainty, regard this book as authority for any period earlier than, say, 750 B. C. For that period, it simply adds some picturesque details to what we know already about the arts and commerce of the time of Solomon, 250 years earlier. Whether the author of 'Job' was, or was not, correct in putting these descriptions into his poetic reconstruction of a distant antiquity, he cannot be fairly regarded as the "first writer" on mining.

TUNGSTEN.—The output of tungsten ores in Queensland, Australia, which in 1901 and 1902 was only 72 and 55 tons, increased in 1904 to 1,538 tons, while for 1905 the production up to September 30 amounted to 1,029 tons, when the price reached $225 per ton. The price has fluctuated greatly, having been down to a $90 average for 1900 and 1901. It increased still more during the close of last year, going up to $.80 per ton. Such remunerative prices are greatly stimulating the industry and will make some important mining centers. There is great need in Queensland for a cheap and effective machine to save the finer and more flaky portions of molybdenite. In dressing the ore the larger lumps of molybdenite are broken off from the attached quartz by hammer, washed, and put aside for bagging. The finer stuff is screened and that remaining on the screen roughly jigged in water. The heavier lumps collect at the bottom, but the more flaky material, owing to its buoyancy in water, cannot be separated from lighter quartz. A great deal of it is wasted, as there is no sale for anything but clean mineral. The amount of this class of ore, however, does not warrant the use of expensive machinery.—*Consular Report.*



A Riffle for Saving Platinum Sand.

COPPER CONSUMPTION.—According to L. Vogelstein & Co., of New York, the German consumption of foreign copper during January, 1906, as compared with the same period in 1905, was:

	TONS	
	1906.	1905.
Imports	10,333	7,500
Exports	1,099	926
Consumption	9,234	6,574

Out of the above, 7,586 tons were imported from the United States.

THE Barrientos tunnel, 11 miles from the City of Mexico, which is owned and operated jointly by the Mexican National and Mexican Central railroads, it is said, is unique in four respects. It was driven at the fastest rate ever attained in railway tunnel work in Mexico; its cost per unit of excavation was lower than that of any other similar work in the Republic; it is the only double-track tunnel in Mexico, and it was constructed without the loss of a single life. It is 735 ft. long, 37 ft. wide and 28 ft. high, and is lined with concrete blocks.—*Iron Age.*

The Best Riffle for Platinum.

Written for the MINING AND SCIENTIFIC PRESS by DENNIS H. STOVALL.

There appeared recently an article in the MINING AND SCIENTIFIC PRESS, describing the simple panning method of saving platinum sand, as devised by Mr. Wimer, manager of the Deep Gravel mines in Waldo district, southern Oregon, and which is now being used by many placer miners in both California and Oregon. Mr. Wimer is also encouraging his brother surface miners in the work of installing riffles of a design and pattern that will save both the flour gold and the platinum sand. Experience has taught that the best possible riffle for the tailing-flume is steel-strapped scantlings. The next best is blocks, four inches high. For a large flume these scantlings can be 10 or 12 ft. long, and they may be as short as six ft. Those employed at the Deep Gravel mines are 10 ft. long. They are regular 2 by 4-in. scantlings, with ⅝-in. steel straps bolted on the upper edge. The straps are 2½ in. wide, thus projecting over a quarter of an inch on each side. Blocks 1½ in. wide are nailed between the strapped scantlings at each end and in the middle, as spreaders. This leaves a space of three-quarters inch between the straps and of one and one-quarter between the poles beneath. This space beneath the straps and between the poles will of course fill up with small rocks. But that is one of the features of the riffle as a gold-saver. The narrower space between the straps makes it impossible for the rocks to 'boil out,' and they serve the double purpose of holding the platinum sand and disintegrating the clay.

The lower edge of the scantlings to which the steel straps are bolted should be beveled one-quarter inch, so that they lean to one side when fastened down. Every scantling in each section of flume should lean the same way, of course, but to prevent the water from running too heavily to one side, the poles should be reversed in each alternate section. The purpose of leaning the riffle-poles is to switch the platinum sand and light flour gold downward; otherwise they would travel over the smooth steel surface without diving into the riffles below.

Cross-riffles of any kind will not do, because they agitate the water of the flume or sluice; a 'boiling' riffle will cast out fully six-sevenths of the platinum. For the same reason, a reservoir head, self-shooter or any avalanche method of mining, while efficient in washing out and uncovering heavy gold, is destructive to good saving. As a matter of fact, a great flow of water is not needed in a sluice. No more water should be used than is absolutely necessary to move the material over the riffles, to prevent clogging and choking, for the deeper the water the greater its lifting power, and it is the lifting power that prevents the settling of the lighter particles. No riffle should ever be employed that 'lifts' from the bottom of the box. For this reason, the old-time pole riffle—the one made from two to four-inch fir and pine poles laid side by side on the sluice floor—such as is used on many placer mines, is a poor device.

The four-inch block riffles are quite efficient if properly placed, and if care is used in handling them at clean-up time. In order to save the platinum that has lodged between them, the blocks should not all be removed at one time. Only every alternate section should be lifted, leaving the lower section intact. In this way, the sand that is disturbed, in the removal of the entire mass for panning over a tub or vat, is caught and held by the riffles yet in place. As an illustration of this method, suppose the sections of sluice are numbered 1, 2, 3 and 4 from head to tail. The water should all be turned off, with the exception of just a slight flow with which to wash the blocks. Lift the blocks in sections 1 and 2 first, leaving a set in place every 24 ft., provided the sections are of standard size—12 ft. long. When the blocks are out, turn on enough water to wash the clay and top material clean, if enough is not already flowing. Then go into the flume with a shovel and scrape everything loose from the bottom of the flume. It is not a good plan, in shoveling, to scoop up the detritus in big cakes, or to turn it over in huge chunks; simply break it up, stir and loosen it, and when of proper consistency, dip out and pan. This can only be acquired by practice; but as every placer miner is an adept with the pan, it only remains for him to have the necessary patience. But even the best panners can only reduce the residue just so far. There is a certain proportion of the platinum that is too fine to be saved by panning. For this reason it is a good plan to take that portion of the black sand which cannot be saved in any other way and dry it out, after which it can be put in a blow-pan for blowing and thumbing over till the last particle is saved.

Pyrite Smelting Without Coke.—II.

Written for the MINING AND SCIENTIFIC PRESS by LEWIS T. WRIGHT.

It has been shown in a previous article* how successive increments in the proportion of pyrite to the total smelting burden of a blast furnace were attended by a corresponding decrease in the quantity of coke required as accessory fuel in the smelting process and at the same time in the grade of matte produced.

The grade of matte obtained in the smelting of calcined pyritous ores depends chiefly upon the amount of oxidized iron in the charge or, conversely, upon the proportion of iron sulphide, that is, it is determined by the amount of 'solid' oxygen in the charge or by the proportion of 'solid' oxygen to sulphide. It depends also upon the amount of gaseous oxygen left over after the carbon of the coke has been satisfied and, to some extent, upon the grade of ore; but in the case now under discussion the influence last mentioned may be neglected, because on an average it remained constant, and we are not dealing with abnormal results.

It will be interesting to consider for a moment what the oxidation by 'solid' oxygen means in practice. To burn an equivalent of FeS_2 to FeO and $2SO_3$ with the solid oxygen of Fe_2O_3, as in the old smelting and roasting processes, it is necessary to have five equivalents of Fe_2O_3 to one of FeS_2, or 10 of oxidized iron to one of sulphide iron. It was impossible to arrive at this degree of oxidation in a single heap-roasting, or in any economic reverberatory roasting of lump or fine ore in one stage; it could only be achieved in the slow oxidation of the burners at sulphuric acid works which use the purer forms of pyrite. On account of this difficulty in oxidizing so large a proportion of the iron of pyritous ores, the old processes employed so many successive roastings and smeltings.

It is only very lately that the blast furnace has been used as an oxidizing furnace in its fullest sense, and I cannot doubt that if metallurgists will deliberately set themselves the task of pushing the use of the blast furnace to its limits as an oxidizing method, they will attain results very different from those to which they have been accustomed; then pyrite smelting in one stage, before converting to blister copper, will become a general practice.

Results given in my previous article show the relation between the grade of matte and the coke consumption. Grade of matte in such a case represents in a general way both classes of oxidation, namely, by solid oxygen as Fe_2O_3 or gaseous in the air-blast.

The following table shows the relation of coke consumption and grade of matte in the case of cold blast. Monthly averages over a long period were arranged in groups according to the grade of matte produced from the same ore and with the same general working conditions:

COLD BLAST.

Percentage of copper in matte.	Percentage of coke to total burden.	Number of months in average.
22 7	7.6	9
28.5	8 2	12
33.0	8.65	11
37.7	8.7	8
41.9	9.2	17
58 0	10.2	8
65.2	15.1	3

It is important also to consider the relation between the sulphur in the charge and the grade of matte produced and the coke consumption; this can be seen in the following table of results, each being the average of one month's furnace work:

COLD BLAST.

Percentage of sulphur in charge.	Percentage of copper in matte.	Percentage of coke of total burden.
24 5	20 1	6.8
22.8	19.3	7.1
19.5	24.6	8.5
17.0	26.4	7.7
13.6	41.4	10 2
7.7	60.9	16.3
6.8	69.4	15.7

When hot blast was first tried at Keswick it was quickly realized that the coke consumption could be cut down with increase of furnace capacity and, though there were some defects in the design of the hot-blast stove that caused the speedy destruction of the front iron pipes, a better design entirely remedied this trouble.

A six months' comparison of hot and cold blast brought out the following results:

	Percentage of coke to burden.	Percentage of copper in matte.	Tons smelted per sq. ft. per 24 hours.
Hot blast	6.83	49.2	6.91
Cold blast	9.10	40.3	5.87

But to render the comparison complete the consumption of coke with cold blast must be corrected to the same grade of matte made by the hot blast. The coke consumption so corrected is 9.9%. The actual saving with hot blast is therefore 3.07% of coke with 18% increased furnace capacity.

The hot blast brings with it an increased activity; that is one of its merits. There is still another and even more important advantage; with cold blast it was only on rare occasions that unroasted ore could be carried on the charge to make 42% matte, while with hot blast over 50% of the charge could consist of unroasted ore to make the same grade. The attitude of metallurgists in this country toward the use of hot blast in copper smelting is not on the whole cordial, because there have been some failures, perhaps due to the defects in the design of the hot-blast stove, and in other cases the saving of the coke may be unimportant; but the advantages under Keswick conditions were too apparent on its first trial to allow of its aid being rejected.

It will be useful in this discussion to consider for a moment the case of hot blast in iron smelting. Though in the latter case a much greater economy can be shown than in copper smelting, yet the cases are not chemically parallel. When Neilson conceived the idea of hot blast he must have been guided by an instinctive feeling that higher temperature would mean increased furnace activity, but he could not have foreseen all that happened. It is well known that chemical reactions are promoted enormously by increased temperature. Combustion proceeds so much more rapidly as the temperature rises, up to a certain degree of course, which we do not reach in practice, when the counter effects of dissociation are felt. Any practical man would know this. When we come to analyze the results obtained, we find that the most remarkable economy of hot blast in iron smelting was not only that which was the natural result of working at a greater speed due to a higher temperature, but was traceable to another cause that had been unsuspected.

In a case cited by Lowthian Bell† the raising of the blast temperature from 25° C. to 485° C. resulted in the furnace running 2½ times as fast, and this increased activity, which in itself is most important, was accompanied by a reduction of coke from 62.6 to 44.5 cwt. per ton of pig produced.

The cold blast required 111.18 and the hot blast 104.34 Calories‡ per unit weight of pig. This difference of 6.84 Calories is not large and would in itself not have been remarkable had that been the whole story. The faster running due to the higher temperature brought about an economy of only 2.77 Cal., due to the lesser effect of losses by radiation, cooling water, etc., when running fast; and that is about all the heat economy an examination of the analyzed heat balance-sheet will show as the physical result of the increased activity of the furnace due to hot blast. It was discovered, however, that one unit weight of coke instead of producing 2.73 Cal. as it did if burned with cold blast, produced 3.66 Cal. with the hot blast. Here was an enormous economy. The coke was required not only for its physical effect in maintaining a working temperature, but to produce CO to react with the ferric oxide to reduce it to metallic iron, and under the conditions of cold blast the carbon was oxidized in the proportion of 6 12 units of CO to one unit of CO_2. With heated blast, the ratio fell to 3.74 units of carbon as CO to one unit as CO_2. It is this much smaller ratio of CO to CO_2 (since much improved) that accounts for the production of 34% more Cal. per unit weight of the coke used in the case cited above, of hot blast in iron smelting.

In our case the carbon, instead of playing a necessary rôle, is counter-active to pyrite smelting and must be kept out of the furnace as much as possible. It is an expensive middleman, and for the work it does in promoting production of temperature, exacts too high a commission in the shape of the oxygen of the blast.

More recently, Gaylor, working with iron furnaces, has demonstrated, by large scale practice over long periods, that by drying the blast an extraordinary economy is attained, namely, nearly 20% of the coke consumption. One-third of this economy is explained by Prof. J. W. Richards to be due to the more economical ratio of carbon monoxide to carbon dioxide, that is, 1.24 with dry blast in place of 1.91 with moist blast. The immediate effects of a lower ratio between carbon monoxide and the dioxide are an increase in heat production with the same amount of coke, and a decrease in the amount of oxygen and blast required, and the losses that the moisture in this and the heating of the diluting nitrogen entails.

In the future smelting of cupriferous pyrite, carbon will play a subservient part.

I will now review what was finally done at Keswick by keeping coke off a pyrite charge and pre-heating the blast. All the ore, both fine and coarse, was smelted direct in the blast furnace instead of four-fifths undergoing a preliminary outside roasting. For the production of 34% matte the coke was reduced from 8.7 to 0.1% and the furnace capacity was largely increased.

It would have appeared paradoxical in the days before hot blast was applied to iron smelting, to state that hot blast would result in an economy of 30% of the fuel, because it was not then known that the carbon ratio would be so favorable. In our case, we knew beforehand that taking off carbon from the charge would promote the oxidation of the pyrite by gaseous oxygen, and it was quite reasonable to believe that carbon burned outside the furnace to heat the blast would, by reason of the introduction of its heat directly into the smelting zone with the blast, be productive of a more economical and active result than by its introduction at the top of the furnace, where some portion of it is consumed before reaching the actual seat of operations. It is for that reason we found in our work, with partly calcined charges, that one unit weight of carbon burned outside the smelting furnace to heat the blast would replace three parts burned inside the furnace. In the future, by suitable design, the heated gases issuing from the top of the furnace will be made to heat the blast, and then by forcing the oxidation a matte of high enough tenor for converting will be produced in one operation without coke. In order to carry on this operation without coke it is evident that there must be a certain amount of oxidation of the pyrite, and it will be my object now to show in practical terms what is the import of this necessary and minimum oxidation.

From practical results, I find that when the furnaces are running without coke, the charge contains so much sulphur and so much iron as sulphide, and of this sulphur about 77.5 to 90% is eliminated as SO_2. The furnace also must run at a certain speed, say, at the rate of 8 to 11 tons of total burden per square foot of hearth-area per 24 hours.

In the self-smelting of pyrite there are two governing factors, namely, amount of iron and sulphur oxidized per unit weight of charge and the number of unit weights of charge smelted per unit of time. I propose to examine these factors and to give them a simple practical expression.

When pyrite is introduced into a smelting furnace, one-half of the sulphur might be eliminated by the heat alone, and this sulphur might rise to the top of the furnace and there burn to SO_2 with air drawn in below the hood. In practice, only a trifling amount of sulphur escapes combustion there. Thus we could convert the FeS_2 to FeS by the elimination of 50% of its sulphur, and but a trifling amount of useful work would have been done toward the concentrating of the ore into matte. It is only after 50% of the sulphur has been eliminated and the iron, as well as the sulphur, is burning, that the really useful work of concentration commences. Let us assume a sulphur elimination of 90%. That would mean an oxidation of 80% of the iron combined with the sulphur in the form of pyrite. It is found in practice that a charge containing 30 to 33% of its weight as sulphur, which sulphur is practically combined with iron as sulphide, will run without coke under proper conditions of air-supply, etc.

The sulphur elimination will vary, of course, within certain not very wide limits. If, with a charge containing 32% of sulphur as sulphide, 90% be oxidized, then 0 288 of a unit weight of the furnace charge will be eliminated as SO_2, and there should be a corresponding oxidation of 0.224 of iron which goes into the slag as FeO. We can neglect the small amounts of magnetic oxide of iron in the matte and metallic iron in the slag. It is a difficult and complicated matter to get a chemical control of the iron of the charge, part of it being oxidized iron in the converter-slag and flue-dust, and there will also be errors in the sampling of the several components of furnace-charge and products. To obtain an absolutely correct balance sheet of the elements of the charge through all the operations is certainly not a simple task.

In the case of an actual charge containing 31.62% sulphur that was running satisfactorily without coke, it was found that 27 8% was lost to the solid products, and presumably in the furnace gases, as SO_2. The iron was 33.25% of the charge, but 5.86 of this amount was calculated from the analyses to be already oxidized, leaving 27.39 as the sulphide iron principally as FeS_2. The slag, allowing for the 5.86 of iron already oxidized, accounts for an oxidation of 21 8 of the iron per 100 of charge.

In almost every case examined there has been a fair agreement between the sulphur and the iron oxidized, allowing for the residuum of FeS that is left on the combustion of the FeS_2, which combustion, of course, is not entirely completed in the blast furnace.

In the self-smelting of pyrite it is found that from 0.23 to 0.27 sulphur per unit of charge must be eliminated as SO_2 in the furnace gases and that from 0.19 to 0.25 iron must be oxidized in the furnace. In a case of partial pyrite smelting the respective amounts of sulphur in the charge and oxidized were 0.23 and 0.17; this was not sufficient for self-smelting and 4% coke was used as an auxiliary fuel.

In the discussion of such technical processes, especially during their early development, when complete scientific investigations are wanting, we require some general practical expression of requirements and efficiencies; it is something to the practical man to have these; to know, in short, that there is a working requirement of sulphur and iron as sulphide on a charge, and that of this a certain percentage must combine with the oxygen of the blast to furnish the heat for the process. I shall state the necessary sulphur component of the charge as 30 to 33% or that one-third of the charge must consist of sulphur with its corresponding amount of iron, which latter for pyrite is about 28% of the charge.

It is necessary for self-smelting that of this necessary minimum of sulphur, which naturally will vary within narrow limits under different circumstances, about 80 to 90% should be oxidized. For every pound of charge one-quarter pound of sulphur must be burned to SO_2 and one-third of a pound of sulphur as metallic sulphides should be put on the charge.

There are two other features of this smelting pro-

*This journal, February 24, 1906.

†*Journal* of Society of Chemical Industry Vol. IX, p. 691.

‡The Calories used in this and previous article are the big Calories usually spelled with a big C.; that is, 1,000 grams water raised 1° C.

cess that require attention and reflection: One, into which the element of time enters, is the speed of smelting. This determines the total heat production, which must be sufficient after all the losses have taken place, and these will not all vary in proportion with the speed of the furnace running, to discharge the matte and slag from the furnace spout at a temperature, say, about 1,250° C. so as to allow of their being handled in settlers, launders, ladles, etc. The speed or rate of running of a furnace can be expressed by tons of charge smelted per 24 hr. per sq. ft. of hearth-area. In my experience in the self-smelting of pyrite from about 8 to 9 tons, running up to 11 tons on occasions, and not falling below 6.5 tons, are required. A practical expression of necessary furnace speed is therefore about 8 to 9 tons. This is much higher than the usual practice with coke-aided smelting; nine tons per 24 hr. per sq. ft. is close to 12.5 lb. per minute.

In one instance the respective amounts of iron and sulphur oxidized per unit of charge were found to be 0.22 and 0.28; therefore the weight of iron and sulphur respectively being oxidized per square foot of hearth-area per minute were:

12.5 multiplied by 0.22 equals 2 75 lb. iron.
12.5 " 0.28 " 3.50 " sulphur.

The oxygen required for these quantities is:

2.75 multiplied by $\frac{3}{4}$ equals 0.78 lb. oxygen.
3.50 " 1 " 3.50 " "

Total.....4.28 " oxygen.

The furnace results, and I am citing from an actual case, show that 4.28 lb. oxygen were being taken to convert the sulphur to SO_2 and the sulphide iron to FeO per minute per square foot of hearth area.

It is now time to consider how much air is required to furnish this amount of oxygen, and it must be remembered that its efficiency in burning sulphides is not 100%. If pyrite burned according to the equation $2FeS_2$ plus 11O equals Fe_2O_3 plus $4SO_2$, it should give a gas containing 16% SO_2 or, if the iron burned to FeO, a gas containing 17.5% SO_2, making no allowance for the trifling amounts of SO_3 formed. I have repeatedly inevstigated this matter with burners in acid works, with roasting and smelting furnaces and converters, and in the laboratory; and I doubt very much whether any such gas can be obtained.

When the SO_2 reaches 12% of the furnace gases the combustion of the sulphide ceases. As a result of these investigations and from practical experience I believe that 70% is about the outside efficiency of air in roasting or smelting pyrite, and I will adopt this factor of efficiency for the present and calculate the amount of air required for the 2.75 lb. iron and 3.50 lb. sulphur oxidized per min. per sq. ft. of hearth-area. One pound of oxygen is contained in 55 cu. ft. air at 72° F. At an efficiency of 70% there was required

for the above amounts of iron and sulphur: $\frac{4\ 28 \times 55}{0.7}$

equal to 336.3 cu. ft. air. Call this 350 cu. ft. of air per square foot of hearth. A furnace of 44 sq. ft., in pyrite smelting, will, under the conditions of the example cited, require 44×350 or 15,400 cu. ft. air per minute.

It has been shown in this article that for the self-smelting of pyrite, a certain quantity of iron and sulphur must be smelted per unit of time per unit of hearth area, and that because all the iron sulphide* on the charge will not be oxidized a certain excess, over and above the quantity required for the heat production, must be contained in the charge, and it is hoped that enough details and explanation have been given to make it clear why the man who starts out to smelt pyrite without providing a certain amount of air cannot expect to succeed in dispensing with coke or in attaining an economical degree of concentration.

COMPOSITION OF MOLDING SAND.—Molding sand is made up of two distinct and necessary components: First, silica in the free state, and, second, silicate of alumina. The free silica gives grain, refractoriness, porosity and low shrinkage to the sand, while the silicate of alumina furnishes bond. Free silica would be useless without the silicate of alumina, as it would not hold together. Silicate of alumina would be worthless without free silica, as it would not have sufficient porosity and would have too great a shrinkage. A confusion exists in the use of the word 'silica' in respect to sand, which I shall endeavor to avoid by designating the silica existing in the free state—quartz silica. There are several other substances present in all sand. These impurities are not at all desirable and are present from necessity rather than from choice. Quartz silica and clay in correct proportions can constitute a good molding sand without the presence of any other substance.—*Iron Age.*

*This term is used to include both FeS_2 and the residuum of FeS left by the partial oxidation of the former.

Making a Whip-Hoist.

Written for the MINING AND SCIENTIFIC PRESS by MATT. W. ALDERSON.

The prospector hoists the rock broken in sinking his shaft with a windlass. If he does any development work when the shaft is down, windlassing becomes arduous. He now needs a whip-hoist. For distances under 120 ft. this hoist is expeditious and economical. There are several ways of making a whip-hoist, the simplest, in my experience, requiring but four poles of four to six-inch diameter, 16 ft. long, two sheaves, four bolts, and a wire rope. The sheaves are placed between two poles, one sheave near the top, over which the rope will pass, and one near the bottom, under which it passes. These two poles then form one of the uprights of a tripod.

A good size for the sheaves is about one foot. Bolts should be of such size as to go through the holes in the sheaves, not less than three-quarter inch, and two of them will need to be 12 to 14 in. long, the other two about eight inches. The lower sheave should be set so that the rope will be about one foot above the track on which the horse walks. The poles should be set so that the upper sheave will be squarely over the center of the skid-way; in hoisting the bucket will be lifted from the skid-way a few feet below the mouth of the shaft. The drive-way for the horse may be at any one of the four sides of the shaft.

Two buckets are needed to work to advantage, one being filled below while the other is being emptied on top. An iron bucket of such size as may be deemed desirable can be bought at any store dealing in miner's hardware, and such a bucket is better and cheaper than one made at the mine. Occasionally, a prospector is unable to provide himself with this appliance and he must make a bucket for himself. In such case a very good bucket may be made from a 30-gal. vinegar or whiskey barrel, from the top of which about four inches have been cut off. Three hoops, stronger than those usually on the barrel, will be needed to strengthen it. The barrel should have an iron strip from the top down the sides and under the bottom; to this the bail should be attached. There should be a ring in the bottom of the bucket for the operator to hold on to when discharging contents.

Fig. 1.

Fig. 2.

Fig. 3.

The poles for the skid-way of a whip-hoist should stand in a straight line from the top of the shaft to the bottom, and for a bucket of the size described they should be 14 in. apart, center to center. Some miners may think the bucket would ride high on such a skid-way, but it really rides easier when a little high. The skid-way poles should be laid from the top of the shaft down and the ends should be beveled, the lower poles lapping on those above, to prevent any chance of the loaded bucket catching on a joint. See Fig. 1. There should be a safety-clutch on the rope, with which one may easily hook and unhook the buckets. The accompanying illustrations give clear ideas of such a hoist as has been described.

A whip-hoist is a most useful and economical arrangement. The raising of buckets filled with ore or waste is a straight pull on a horse and the loads are brought out of the mine as fast as a horse can walk. Two men and a horse will bring out several tons per day. In hoisting from a shaft 100 ft. deep, 12 buckets per hour is a good average for the first 50 ft away from the bottom of the shaft, and 10 buckets per hour for the second 50 ft., when the buckets are loaded with a shovel.

THE excavation of iron ore by electric and compressed-air shovels instead of steam shovels is to be experimented with on the Mesaba range in Minnesota, and an electric shovel is now being built by the Bucyrus Company. The purpose is to economize in power production by generating power at one large central plant instead of by a boiler and engine on each of the numerous machines. The electric power would be generated at the new Duluth water-power plant. Experiments are also being made with a cableway of about 1,000-ft. span, handling grab buckets, the cableway traveling over the ore bed as the work progresses.—*Engineering News.*

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Austin, Nev., marked Y. Z., is diorite.

The metallic mineral from Greenback, Ore., is platinum.

The brown, glassy mineral from Tonopah, Nev., marked L. E. S., is a variety of garnet (grossularite).

The rocks from Searchlight, Nev., are: No. 1, quartz-porphyry; No. 2, syenite; No. 3, also syenite.

Sample No. 1 from Oroville, Cal., marked Selkirk, is volcanic ash; No. 2, marked Orovillo, is olivine diabase.

Sample No. 1 from Princeton, B. C., marked D, is felsite. No. 2 is serpentine, in which occurs a little finely disseminated iron and copper sulphide.

Sample No. 1 from Los Angeles, Cal., marked F. G., is a coarse, semi-schistose granite. The prominent minerals are quartz, orthoclase and biotite mica. No. 2 is a sandy mica schist.

The lead-gray mineral from Seattle, Wash., over the determination of which there has been some question, this department having classified it as stibnite, has been submitted to several expert mineralogists, and careful tests made by them has resulted in confirming the original determination as given in the 'Prospector.' The mineral is stibnite, and contains no molybdenum, lead or other mineral than antimony and sulphur.

Sample No. 1 from Goldfield, Nev., marked M. H. D., is mostly quartz stained brown by limonite (iron oxide). The greenish-yellow mineral is halloysite, a product of the decomposition of feldspar. No. 2 is mostly grossularite (garnet). No. 3 is also garnet, with tremolite.

The rocks from Hailey, Idaho, marked J. J. P., are: No. 1, much decayed—probably greenstone; No. 2, aplite, containing some pyrite, possibly gold-bearing; No. 3 is a dolomitic rock, containing free calcium carbonate and some iron oxide. It has the appearance of having come from a vein.

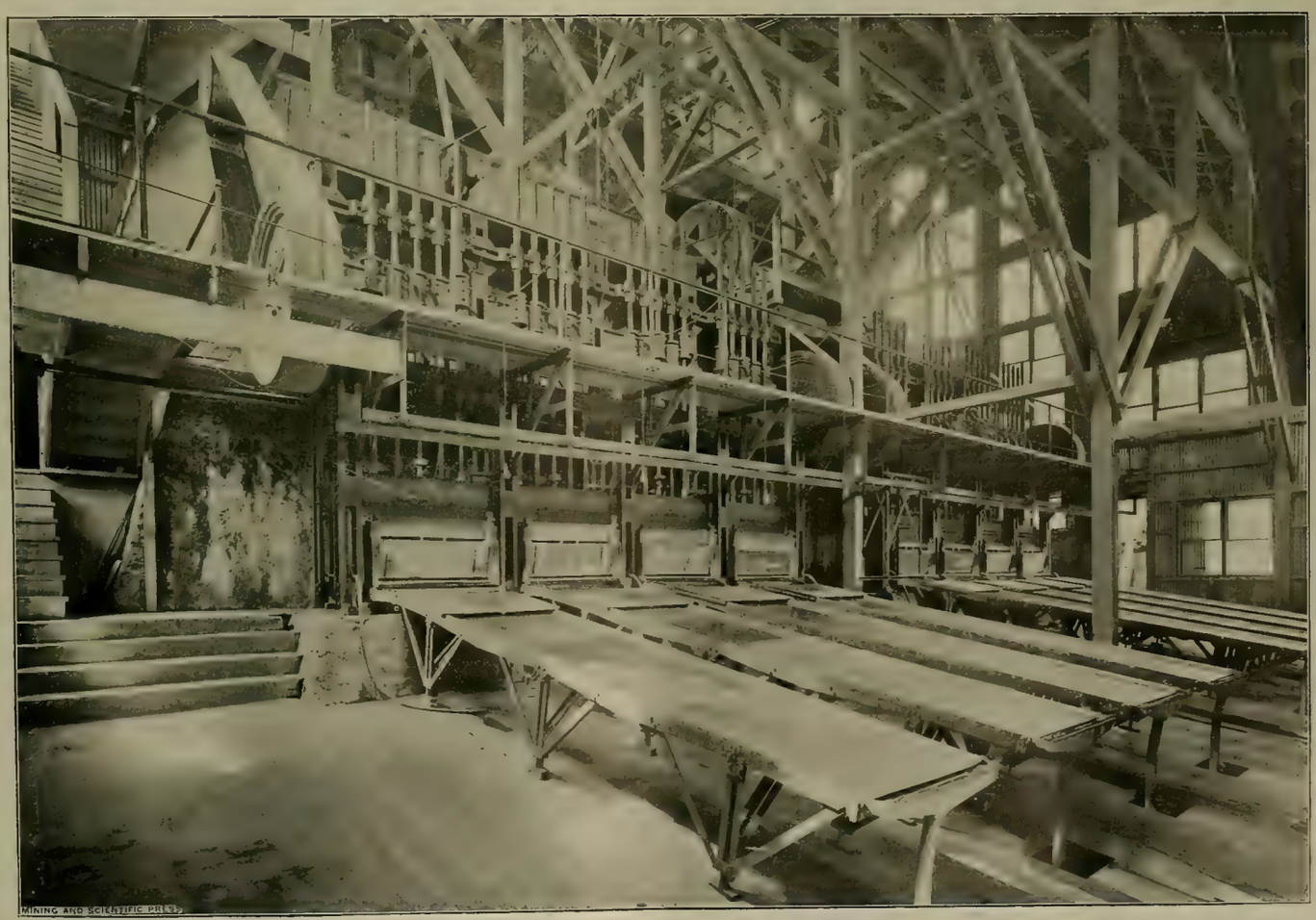
The mineral sample from Bozeman, Mont., is sandstone saturated with asphaltum, and is similar to the California deposits, the material of which is used in street pavements, but is of somewhat lower grade in asphaltum. Prospecting in the neighborhood of this occurrence may be rewarded by the discovery of petroleum.

Samples from Tres Piedras, New Mex., marked R, are: No. 1, rhyolite; No. 2 is a coarse aggregate of quartz grains and feldspar; No. 3 is amphibolite schist carrying iron sulphide; No. 4 is semi-schistose diorite; another, bearing the same number, is quartz schist; No. 5 is an aggregate of both rounded and crystal fragments of quartz, some biotite and earthy cementing mineral; it is a nondescript of some sort, and No. 2 of this lot belongs to the same category; No. 6 is obsidian.

Occasionally senders of rocks and minerals for identification fail to see in 'The Prospector' column the description of their samples. Some of these rocks, etc., are not easy of determination, and it is not always possible to give answers as promptly as expected. The aim is to make these determinations fairly and as accurately as the means at hand and time will permit. No infallibility is claimed in making identifications, but they are, on the whole, correct or approximately so.

The samples from El Paso, Texas, marked W. E. K., may be described as follows: The group of hexagonal hollow crystals is pyromorphite (phosphate of lead), imbedded in cerusite (lead carbonate); No. 2, granite; No. 3, diabase; No. 4, diabase; No. 5, diabase; No. 6 shows numerous rounded grains, and is evidently a fragmental rock, probably made up of volcanic materials, including plagioclase; No. 7 and 8, basaltic rocks; No. 9, a dark colored quartz porphyry; No. 10, quartz porphyry; No. 11, quartz porphyry; No. 12, basalt; No. 13, feldspar porphyry; No. 14, quartz porphyry; No. 15, pink orthoclase and some quartz—essentially granite—but the mica or hornblende occurs very sparingly; No. 16, the same as No. 14; No. 17, granite, same as No. 15; No. 18, similar to No. 14 and 16; No. 19, granite; No. 20, granite; No. 21, granulite; No. 23, sandstone; No. 24, pegmatite.

NORTH STAR MILL, UNDER CONSTRUCTION.



INTERIOR OF MILL, IN OPERATION.

The Central Mill of the North Star Mines Company.

Written for the MINING AND SCIENTIFIC PRESS by A. D. FOOTE.

It is a little over a year since a new 40-stamp gold mill was built near the central shaft of the North Star mine, making 80 stamps now in operation. Although a small mill, it has some peculiarities of design and construction which, after the test of experience has proved their value, may be of interest.

The main foundations are situated about 500 ft. from the shaft on an outcrop of rock at the edge of the waste dump. Extensive excavation on the lower side of this outcrop was necessary to get the required fall of 90 ft. from the top floor to the concentrator-floor of the mill, adding $18,000 to its cost. The foundations and walls, including the ore-bins, are all made of rough cement masonry and the floors are of concrete. The stone was taken from the waste dump adjoining and was so absolutely shapeless that it was deemed advisable to build the outsides or faces with the best of the stone in the usual way with trowel and mortar, then filling in between with all sizes of stone in layers of 6 to 10 in. and then pouring in very wet grout containing five parts of sand to one of cement, the grout being wet enough to keep the work under water as it was filled up. Sand was obtained by washing the tailing of the North Star mill. The cement cost about $5 per barrel, but the sand and stone were so cheap, as also the laying, that the masonry cost rather less than $4 per yard. The battery-foundations were built in the same manner, but the cement ingredient was increased to a proportion of three to one, and near the top it was as two to one. The upper photograph on the preceding page shows the foundations and walls except the upper bins which were built on the slope of the waste-dump after it was filled out to the proper grade, allowance being made for settling. One of the smaller photographs (Fig. 1) shows how the battery-foundations were put in. The anchor-bolts and anchors were placed in position by being hung from a wooden frame and then grouted-in solid all the way up, the top smoothed off with nearly pure cement and, after slight setting, scraped true to a steel straight-edge. (Fig. 2.) When the main walls and the piers for the foundations of the electric motor and rock-breakers were built, the dump was filled out to grade; the lower bins were filled with waste to near the grade-line; the bin-floors were then laid with stone and mortar, and smoothed over. After the walls of the upper bins were built on the dump, as stated, the floors were finished as in the lower bins.

The water supply for the mill is taken from the main water system under about 600-ft. head and is first used on a Pelton wheel, set on a level with the top floor, which drives the rock-breakers; thence it is led to a masonry tank built in the waste dump, back of the mill, from which pipes lead it down through the mill.

The mortars and battery-frames were placed on their foundations with a sheet of pure rubber, one thirty-second of an inch thick, between to act as a paint and keep out water. The anchor bolts are two inches in diameter and the nuts were set up with a hammer, wrench and sledge, working round and round a little at a time until they would move no more. There has been absolutely no movement or vibration of the mortars or bases of the battery-frames as yet.

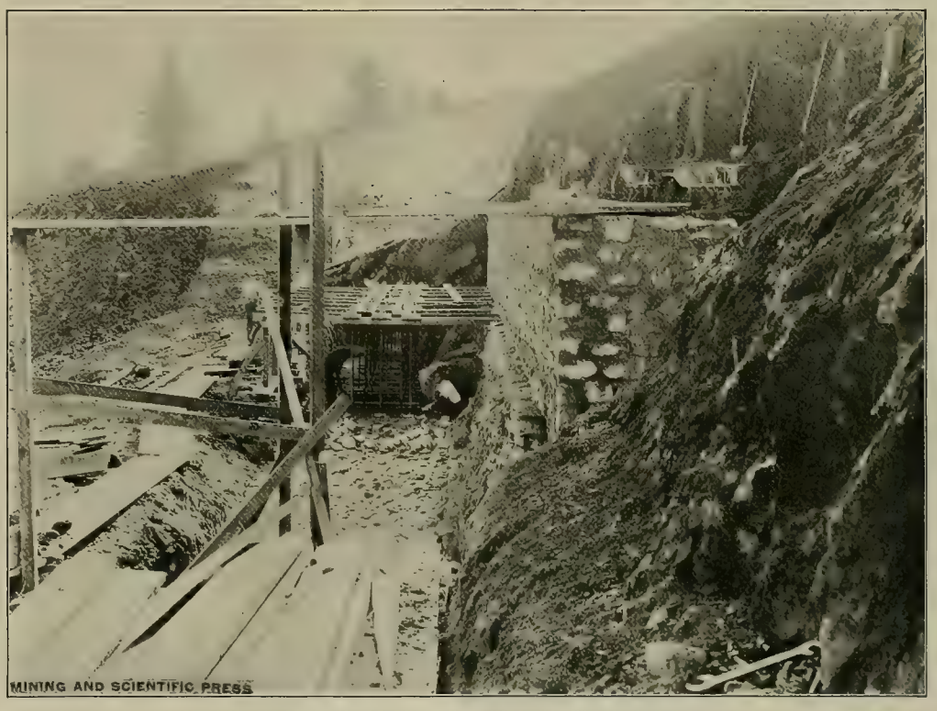


Fig. 1. Construction of Battery-Foundations.

The battery-frames of steel-channels, arranged as shown in the lower photograph, have proved too light and have an intense vibration, of slight amplitude, near the cam-shaft. Two pieces have cracked and been replaced with heavier ones, but the heaviest standard shapes of channels within reasonable dimensions are altogether too light for this work. They should have been I-beams, which are made much heavier for the same dimensions, though they may not be as convenient for connections. The stamps average 1,050 lb each; the drop is eight inches 96 times per minute. There are chock-blocks and inside plates, with a discharge eight inches above the die. The screens are somewhat original, each one is a very thin sheet of steel, 10 by 50 in., punched with 400 round holes to the square inch, one-fortieth inch diameter. A space of solid metal is left around each square inch, which effectually prevents breaking. They last about three times the ordinary screen, or until the holes begin to show enlargement from wear. The sheet of steel is so thin that no appreciable clogging occurs. (See photographic print direct from the screen, as reproduced in Fig 4).

The stem guides are also somewhat original, as shown in the photograph, being very long and carefully turned out to one thirty-second larger than the stems. They have given no trouble and it is thought that this close fitting accounts for the stems wearing so well; only two having broken since the mill started.

It was anticipated that rivets would not stand well in the battery-frames and Columbian lock-nuts were largely used in their stead. It was soon found that the few rivets used were loosening and lock-nuts were substituted everywhere. For a few months more or less tightening of nuts was necessary, but they soon got their seat and remained perfectly tight.

The plate-tables are of cast iron, planed true on top, 18 ft. long and 44 in. wide. The copper plates are 48 in. wide, turned up two inches at the sides, with a curve instead of a corner; the curve allowing expansion in the plate without bulging. The upper edges were bent over flat onto the iron sides of the holders and fastened with brass machine-screws tapped in. The quicksilver traps are built in the concrete floor from which iron pipes, laid in the floor, lead to the concentrators. In the place of the pipes shown in the photograph, at the lower end of the tables leading into the traps, we now use small spitzkasten which serve to size the pulp sufficiently for the concentrators. Across the lower end of the battery-floor is a sunken gutter which carries all washings to concrete settling-tanks on the lower floor.

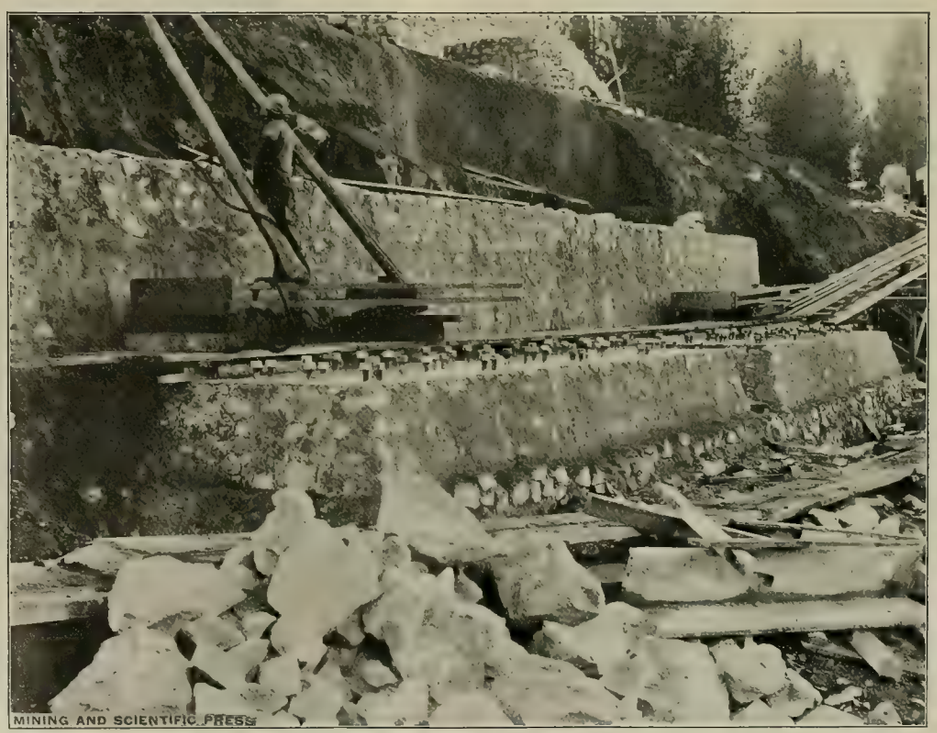


Fig. 2. Battery-Foundations Completed.

The batteries are driven by an induction motor placed on a stone pier that is level with the rock-breaker floor. This arrangement of the power, above and behind the batteries, brings the small pulleys high up, so that they carry the weight of the belts, and it also brings the tight belt on the under side, allowing the use of comparatively loose belts and making a saving of nearly 10% in power.

The clean-up room has the stone foundations carried up five feet high all around. The floor and panning-tanks are of concrete, and the tank-overflow and floor-washings are led in pipes to a concrete settling-tank on the lower floor. An inclined circular ball-grinder for the amalgam and hot and cold water, complete the equipment of the battery-floor.

On the lower, or concentrator-floor, are nine Dodd concentrators, the middling from the first eight going to the ninth. These machines may be described as a circular Wilfley table set on a wagon-wheel, through which is a vertical axle. It will be seen (in Fig. 3) that this arrangement admits of rigid construction, with no appreciable wearing parts. When once set correctly, little attention is needed and their work is fully equal to, or better than, the straight

tables. The ore is run onto the top floor by an electric trolly with fourteen 2½ ton cars which dump onto the grizzlies. It requires nearly two hours each day to furnish the mill with ore from the shaft-bins This trolly also takes out the waste, hauls ore to the old North Star mill and the concentrate from both mills to the cyanide plant.

The mill cost, including the $18,000 expended on excavation, $74,600.

Yukon Mining Laws.

By J. B. Tyrrell.

A mining code should encourage men to find valuable mineral, should provide for the easy acquisition of ground after mineral has been discovered on it, should protect the owners in the employment of any rational mining methods which they care to adopt, and should encourage them to become permanent residents of the country, and to use the riches extracted from the ground as far as possible for the country's development and for the furtherance of the growth of such other industries as it may be able to support.

Miner's License — According to the regulations now in force in the Yukon Territory, every man having any interest in mining property must hold a miner's license, and no location is valid unless the locator is at the time in possession of such a license.

As a quick and easy method of raising a revenue from a throng of enthusiasts rushing to some new strike, this tax has no equal. Seven or eight years ago every man in the Territory hoped to be a mine-owner, and so every man took out a license, and the amount of the revenue thus contributed to the Government was very large. In the year ending June 30, 1899, the amount collected from this source alone was $227,354. Now the number of those who buy licenses is small, being limited to those who actually own mining property, and men who deliberately go prospecting

If this tax is necessary it should be levied on every man, whether in the towns or at the mines, with the exception of the prospector, for mining is the one productive industry of the region and all the people are supported by it either directly or indirectly. If the miner is taxed, the storekeeper also should be taxed, and if the one cannot hold his property without a license, the other should not be able to hold his account against the miner without a license. At present it is a special tax on the vital industry of the country.

In case the tax continues to be levied, the prospector should be excepted. He certainly should be free from impositions of any kind; he should receive the greatest possible encouragement to prospect. People travel about the Territory for many reasons and on many errands, and often find themselves favorably situated for doing a little prospecting; but as a rule such travelers have no license, and so, as they cannot stake claims if they do make discoveries of ore, they will not prospect. It is quite usual to hear the remark from hunters and travelers that they have seen promising surface showings, but that they dared not do any development work because they were not in possession of licenses, for if they should find anything, some one else with a license might come along and stake a discovery over their heads. One may sneer at the possibility of such men finding rich ore, but many of the great mineral discoveries on this continent have been stumbled upon by just such wanderers, and it is the height of folly to say to such men, "We will not allow you to prospect." One rich strike by such men would be worth more to the country than all the license fees that have been collected in the Yukon Territory from the time when gold was first discovered to the present.

Again, a man goes into the wilderness with the deliberate purpose of prospecting for precious metals. Everyone recognizes that his success would mean much to the country; but outfit and provisions are expensive and he has the greatest difficulty in getting together sufficient to last for even a few months in the back country. At such time any expenditure of money, however small, is a serious consideration, and it is discouraging to be told that he may not go out to prospect or attempt to develop the country until he has first paid out for a miner's license part of the money saved or collected for a grub-stake.

In Alaska no license is necessary, and the whole country is free and open to the prospector.

Claims —Since September 30, 1905, any new claims staked are 500 ft. long, presumably in the direction of the pay-streak, and from 1,000 to 2,000 ft. wide. but for several years previous to that time they could be staked only 250 ft. long.

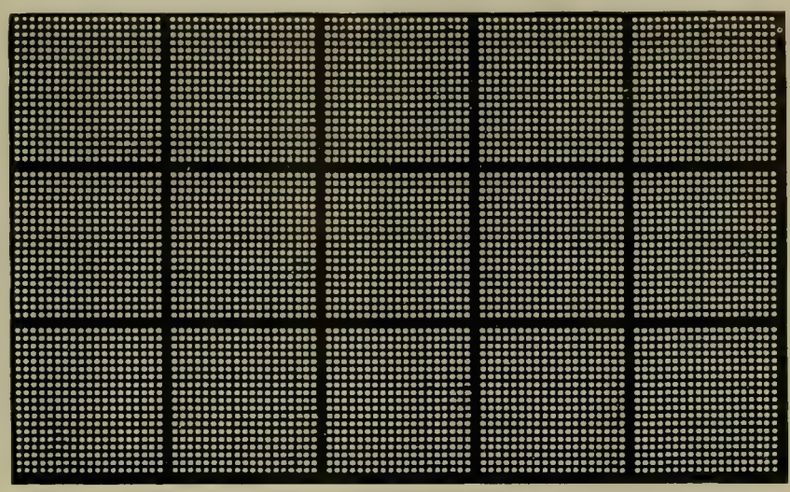


Fig. 4. Piece of Screen. Natural Size.

All claims should be of the same size, and should be as nearly as possible square This is the principle generally adopted in regard to quartz claims, and there is no valid reason why it should not be adopted for placer claims as well, especially such placer claims as are found in the Yukon, where the gold-bearing material is just as completely covered and obscured as in many quartz claims. A square of 1,000 ft. would be a reasonable size for placer claims. In Alaska, which is but a few miles distant across an invisible boundary line, the locators are given 1,320 ft. in the direction of the paystreak and 660 ft. in a transverse direction, and it is unreasonable to expect that prospectors will explore a country where they can obtain claims only 250 or 500 ft. long, when they are but a few miles distant from a similar country where they can obtain claims 1,320 ft. long.

These claims should be located by two stakes, No. 1 stake at one end of the claim and No. 2 stake 1,000 ft. up or down the valley from it. No. 1 stake should govern the middle line of the claim, which would extend 500 ft. on each side of it, and No. 2 stake should be subject to change of position on survey, so that the claim would follow the general direction of the valley. Thus the claim would be located with reasonable accuracy from the first, the locator would obtain the ground he staked, and others would know what ground was open.

According to the present law, the locator is uncertain as to what ground he will finally receive, for the position of his claim is determined by a creek base-line which is almost always run after the claims are located. For instance, the bottom of the valley may be 3,000 ft. wide, and the creek may flow near one side. As water is necessary for washing the gravel, the locator drives his stakes beside the stream and feels confident that he has a claim on the water. A surveyor is sent out from Dawson to run a base-line on the creek, and he runs it down the middle of the valley, though in places, on account of the windings, it will be nearer to one bank than to the other, and the present law declares that the unfortunate locator is to receive 1,000 ft. on each side of that base-line. Thus his original stakes may not be on his own ground at all, but may be far to one side of it, and he may be deprived altogether of the ground which he wanted, which he believed he staked, and which he supposed he owned

Again, as the original claim depends for its position on the base-line to be run subsequent to its location, and not on its own stakes, the amount of ground that is still open to location on one side or the other is altogether uncertain. It is true the ground may be staked at random by stampeders, but no serious development work will be done until the positions of the claims are definitely fixed by the base-line, which may not be for a couple of years after their location. In the meantime, interest in the district may die down, the people may go elsewhere, and the prospecting, which would have been carried out enthusiastically at the time, if the men had known the exact ground on which they had a right to work, is indefinitely postponed.

Representation.—The present law provides that $200 worth of work shall be done on each claim each year, and the regulations of the Gold Commissioner's office fix a scale at which certain classes of work shall be appraised. On concessions, which are larger areas of low-grade ground, it is provided that $5 000 worth of work must be performed each year, such work to be approved by the Minister of the Interior. The intention of these regulations is clear, namely, that a man must work his property more or less continuously, or leave it and allow some one else to work it. In this connection, however, it should be remembered that a gold mining property is only of value on account of the gold which it contains, and that when this has been extracted its value has disappeared, and that care and economy in the extraction of the gold are of far more ultimate value to the community than hasty and wasteful procedure.

The above regulations have now almost entirely lost their original significance, and on claims which the owner deems it expedient to hold over for a time, the representation work has dwindled into a mere tax of $200 on each claim, a tax from which neither the owner nor the country derives any benefit. During the past year there were probably 4,000 claims on which this perfunctory work was done, indicating a waste of valuable capital to the extent of $800,000. When it is considered that concentration of capital is so urgently needed to develop and work the vast gravel deposits of the Territory, this undirected and wasteful scattering of capital and energy is greatly to be regretted.

Title —Claims are held under annual grants from the Department of the Interior, which must be renewed from year to year. This renewal is subject to any change in the laws and mining regulations, and to the acceptance of the annual representation work

Fig. 3. Concentrators in North Star Mill.

by the Gold Commissioner. Concessions are held under leases for twenty years, subject to an annual rental, and also to the acceptance by the Minister of the Interior of annual representation work valued at $5,000.

For the purpose of the small holders, who wish to extract what they can quickly from the ground and then leave the country, the annual leases are in most cases satisfactory; under them the ground is mined hastily and badly, and what gold is left is difficult to recover afterward. Such leases have a tendency to keep the land divided into small lots, and may satisfy the requirements of a roving population; but as a means of furthering systematic mining, encouraging the investment of capital and attracting a permanent population, they are an utter failure. Capitalists are not anxious to invest in remote and speculative mining enterprises unless the title to the property is secure, and there can be no security in an annual lease dependent on the acceptance of certain conditions by an official, and forfeitable for such trivial causes as the failure of an agent to renew a miner's license, or to pay the annual rental on the day appointed. Shareholders of companies will trust a great deal to their directors and managers, but such possibilities of loss will always loom large before them.

The remedy for this is simple. Those who wish to hold their ground cheaply on an annual lease, should be allowed to do so, as long as they remain on their claims for a reasonable part of the working season each year, say, for at least three months. In this way representation and development would go hand in hand, for the two terms should be synonymous, if the former is to have any validity at all. The necessity of residence on a claim would also encourage men to remain within the district.

After a man has placed efficient machinery on his claim, and has opened it up and shown its value, he should be given a title to it that will be perfect for twenty years, at least, without any possibility of forfeiture on account of the acts or omissions of anyone.

In Alaska, a patent to a mining claim can be obtained after a reasonable amount of development work has been done on it, and capital is flowing into that country in abundance, for the carrying on of hydraulic and other mining enterprises on a large scale, while in the Yukon Territory, with its short forfeitable leases, it is almost impossible to induce capitalists to consider investments in properties which would otherwise be most desirable and attractive.*

The Camp Bird Disaster.

The accompanying photographs, which we owe to the courtesy of Mr. B. Kehoe, illustrate a striking scene of devastation. After the snowslide had destroyed the larger part of the 70-stamp mill connected with the Camp Bird mine, a fire broke out and finished the remainder. The cyanide plant, being in a separate building, was not harmed. It was unfortunate that the snowslide should come down just at the place occupied by the most valuable part of the large group of offices and buildings, but it was a wonderfully fortunate coincidence that the mill was shut down at the time of the disaster; the power line had been ruptured by a slide several hours previously, so that there were only seven men in the reading room next the mill; of these, four were injured and one was killed outright. Ordinarily 50 men are employed about the mill.

Camp Bird Mill After the Snowslide.

Both photographs show the smoke arising from the burning mill, but the upper one affords far more than this; it is a fine picture of a mountain landscape. The mill is at 9,400 ft. above sea level and the far peaks are nearly 14,000 ft. in altitude, so that the range of vision is remarkable. Those who have lived in the San Juan will recognize the varying tones on the snow, the dark pines climbing the rocky steep, until breathless they can go no farther, the white tracks of snowslides cleaving the forest in wide lanes, the lone peaks piercing a tempestuous sky and the impression of a vast remoteness — a proud detachment from all human activity, which makes the buildings of mines and mills look like a stray dog in the aisles of a cathedral.

The Mill Burning.

A NEW PROCESS for case-hardening iron has been developed by two Prussian inventors, according to the *Iron and Coal Trades Review*. This process advocates adding to the iron a small percentage of phosphorus combined with a large amount of carbon. The iron is heated in a tempering powder of bone-dust, to which are added 300 gr. of yellow prussiate of potash, 250 gr. of cyanide of potassium and 400 gr. of phosphorus. The receptacle in which the iron and these ingredients are placed is closed and the cracks filled with clay, and then raised to a clear red or white heat. The material treated is then taken out and plunged, while still hot, into a warm bath. It is claimed that a piece of iron can be so hardened that it can not be cut or chipped, but can be welded.

*Abstract from a paper read before the Canadian Mining Institute

RADIO-ACTIVITY. — The hypothesis most generally entertained at present concerning the origin of the enormous power of the emanations of radium is that the power is ultimately derived from the breaking up and death of uranium atoms. Uranium is the most massive element known to chemists, its atom having nearly 240 times the mass of a hydrogen atom. It is supposed that the dynamic equilibrium of these massive atoms is unstable, and that occasionally an atom disrupts or explodes. The event is of extremely rare occurrence, as regards any small group of atoms; but since any appreciable mass of the substance, say a gramme of it, has such an enormous number of atoms, the event of an explosion is of common occurrence. This may be likened to the condition of railroad accidents in the world at large. The event of a fatal railroad accident is rare, and the probability of its occurrence among a given small group of passengers is very small. Nevertheless, taking the aggregate vast numbers of railroad passengers in the course of a year, the total annual number of fatal railroad accidents is relatively large It was observed by experimentalists that a substance which contains radium also contains uranium, and a certain degree of proportionality appeared to exist between them. According to the present provisional hypothesis, uranium will, in the course of millions of years, all be lost by decay into radium, or into substances that in their turn give rise to radium. Radium itself has but a limited lifetime, and breaks up into other substances, of which helium is said to be one. The original stock of energy contained in a massive atom of uranium is thus gradually dissipated in the series of explosions or disruptions ending in relatively inert substances like helium. According to this hypothesis, uranium, and possibly also other substances of massive atoms, are very slowly undergoing disaggregation or disruption with attendant loss of energy; whereas, according to the Laplacian view of the universe, the process of consolidation or aggregation of mass is everywhere in progress, attended by loss of radiant energy.—*Electrical World.*

THE largest electrically driven hoist on the Rand is at the Village Main Reef mine, says the *Electrician.*

The Geology of Jell.

Contributed to the MINING AND SCIENTIFIC PRESS by JAMES F. KEMP.

One of my old friends in college was a very pious individual, named Bill Gosman. His early training had been so strict that he found it difficult in his later years to command a suitable vocabulary with which to relieve his emotions when they became strong, and yet a series of terms which would not offend his conscience. Finally, however, when these occasions arose, he would remark with deep feeling, "Jam the jam thing to Jell."

It is of the geology of Jell which I wish to speak to you and, as I have said, I am the only one who knows about it. For, impelled by that ambition, which every scientific man feels, to spend some time in exploring a new district which no geologist has previously seen, and being anxious withal some time ago to have something striking and novel to describe upon an important occasion like the present, I spent some time in this, the only district near New York which had not previously been exhausted by my colleagues of the geological department.

There have been several travelers in the world's history who have visited Jell. There was Orpheus who went in search of his lost Eurydice; there were Ulysses and Æneas, and in later times Dante. Nevertheless all of these were anything but scientific observers, and while they brought back in each case much that was of great human interest, their references to the geology of Jell are of the most meager character. In fact the references are all physiographic rather than geologic, and relate to plains, rivers, gulches and caverns, without telling us whether the plains were wave cut terraces, lake-basins, or deserts in origin, or whether the rivers were at base-level or not. Moreover, they mix up young, mature and old topographic forms in a way which shows that no one of them had any real grasp of the subject. And as for the geology there is almost nothing said. There remains, therefore, much of deep scientific interest to impart about Jell.

In order to reach Jell you go down to the Tenderloin and then, as has long been known, you are right at the entrance. You hunt around until you find the mouth or crater of the conduit through which the Palisade trap reached the surface. This, contrary to general belief, is on the east side of the Hudson, and from it the hot, molten diabase turned westward, but the old connection was long since destroyed by erosion. At the entrance, much as if you were going into a North River tunnel, you provide yourself with an asbestos suit so made as to be absolutely a non-conductor. When clad in it one can walk without danger amid the most elevated temperatures. The secret of its composition is known to few, but it was familiar to Shadrach, Meshach and Abednego, the three children of Israel who were in the fiery furnace years ago. There are small, transparent windows of muscovite, very much like a stove door, through which one looks without danger. Inside, at the back of the jacket, is an apparatus containing liquid air, for a cooler, and as one expires the exhausted oxygen inside the suit, the latter is fitted with an outlet valve, so constructed as to let only CO_2 pass, since should any free oxygen escape there would be a frightful conflagration under the conditions prevailing in Jell.

Thus provided and having a topographical map ruled in squares, a note book, a compilation book, an infusible platinum hammer, an inside compass, an outside asbestos rock-bag and a sack of condensed food, I set out. I ought also to mention one other ingenious and essential piece of apparatus. My suit was provided with two sets of thermergons or heat generators, one in front and one behind, each outside the asbestos suit. By turning switches, one or both would emit intense heat rays which would be radiated outward, and which, as you will see, were necessary to the trip. I also had an electric lamp.

In the easy descent to Avernus at first you pass over a coarse macadam or pavement of a soft, tufaceous rock, subject to alteration, so that with use it loses all stiffness and resistance. It is called goodresolutionite, and specimens may be even found among uncompleted manuscripts on the surface of the earth. It seems, in its local geologic relations, to be a close parallel with the garnet, vesuvianite and andalusite of the contact zones which are occasionally exposed to view in the upper world, but it extends a long distance, since at present the center of heat is far below the surface.

After a short descent upon the goodresolutionite, I met the level of the ground-water. I noted the change in the character of the wall-rock at this horizon, but did not pause, being keen for the larger problems at greater depth. I waded right into the ground-water, which was of meteoric origin in this case and for which I felt less regard than is cherished by some geologists. Having once gone below its surface a few feet, I turned on the switch of the rear thermergon and at once heat rays were radiated backward, boiling the water furiously to steam of pressures only reached at the point of dissociation of hydrogen and oxygen. The inevitable result was that I was driven forward much as if I had a powerful screw-propeller aft. In a short space of time I passed entirely through the ground-water zone, which, as everyone knows now, is comparatively shallow. John W. Finch has endeavored to show that it is about 1,000 ft. My patent log, which I trailed out astern, registered just 1,017 ft., which shows the extreme accuracy of Mr. Finch's estimate. Having passed the zone of the ground-water, which I may also remark is practically still and moves so little as to be of no particular geologic importance, I walked briskly downward amid dry rocks—just such as we meet in the depths of the Lake Superior copper mines.

Gradually, however, I passed to the limit of the zone of possible fractures, and found the walls of the passage-way closing in and the bottom becoming choked with the spalls and gob which had scaled off under pressure. Moreover, the goodresolutionite began to bulge up in the floor, just as shales and fireclay creep in the entry of a coal mine. For fairly tough and resistant rocks like our local mica-schists and gneisses, Van Hise has calculated that the zone of fracture extends to a depth of 8,342.75 meters. While it is difficult to note in a hasty trip at just what point the possible fractures end, yet by adding to the records of the patent log for the ground-water, the depth of the overlying vadose region and the records of my pacing survey, checked by a pedometer, I found the depth of the zone of fracture to be 7,979.87 meters, or 362.88 meters—say, 1,000 ft.—less than Van Hise's estimate, but on the whole corroborating him very well.

The question may arise in your minds as to how I was able to advance at all as the zone of fracture ceased, but the solution of this difficulty was really quite simple. As the rocky walls closed in, I turned on my front thermergon at moderate capacity, and my rear one at twice this amount. The powerful heat rays melted the rocks for a space of a few feet around, and the extra heat of the rear thermergon generated from the dissolved vapors and occluded gases a preponderating pressure *a tergo* which drove me forward at a good speed and with small difficulty. Gradually I traversed the zone of mixed fracture and flowage, and finally the zone of flowage itself. In the end, and after passing 41,387.63 meters of the latter, I suddenly shot out into an open space and found myself standing upon the pyroclastics which at this point formed the floor of Jell.

You may raise the question as to the possibility of an open space below the zone of flowage, but it strictly follows from physical principles. The zone of fracture ceases because the pressure is so great that cavities are impossible. The rock is squeezed together and compacted as tightly as matter can be. As one penetrates the zone of flowage the matter reaches a point when it cannot be compacted further, and it attains the property of absolute resistance. Below this surface, which is roughly spherical, there lies the region of no strain, and it is a matter consequently of physical indifference whether the central space is hollow or is filled.

So I found myself upon the pyroclastics which at this point form the floor of Jell. I shut off my thermergons, and in the clear, though not bright, unearthly radiance that diffused itself everywhere I sought to examine my surroundings. The cavern was a passage-way of moderate size which led on to more brightly illumined regions beyond. The location was Jell quadrangle, northwest corner. Outcrop, igneous and apparently basaltic in nature. Proceeding 721 meters along the passage to the northeast corner, I found a dike of a leucocratic pyrocrystalline 'jellynose'—striking northeast—and after that uniform granitoid walls of 'gehennose,' which constitutes the main country rock. So far as my wanderings took me in Jell, this was the solid rock and it varies only in that moderate differentiation had produced a greater or less abundance of several constituent minerals. Thus we have dofelic, sodipotassic gehennose, and dofemaniac sodicalcic gehennose. The rock would furnish some interesting microscopic data, but these, though valuable for record, are always deadly dull in a paper that is read.

I pass, therefore, to the real questions of interest which may be solved in Jell. These are the origin and production of the several kinds of the igneous rocks, and the solution of that puzzling problem, the sources of the metallic ores, and more especially the sulphur compounds. My observations show that the various kinds of igneous rocks are produced under the direction of the jevil-in-chief, very much as charges are mixed for a furnace. Thus, that the materials for the various lavas exist at the center of the earth there is no doubt; the only point of interest is the form in which they occur. As a matter of fact, the following are kept in storage reservoirs in a molten state and under pressure. They can be tapped off as needed, and in any desired proportions. There is a reservoir of pure SiO_2, one of Al_2O_3, one of Fe_2O_3, one of FeO, one of MgO, one of CaO, one of K_2O and one of Na_2O. In these there are slight impurities of P_2O_5, Cl, S, etc., but there is also a separate reservoir of FeS_2, mingled with lead, zinc, copper, silver and gold.

When the jevil-in-chief orders andesite, he issues instructions for the proper proportional parts of these ingredients and the subordinate jevils run them together and over into a spout which connects with the volcanic conduit. Into this, and on the principle of the injector, are run under enormous pressure steam and other mineralizers, and the whole mixture, boiling and seething, fuses its way through the zone of flowage and so to the upper world. At rare intervals the metallic bath is tapped into it, especially during the expiring stages, and then ore deposits result as the igneous action in the upper world draws to a close. Time fails me to enlarge upon these topics, although, as you will see, they furnished the clew to much that has troubled many thinkers hitherto.

One other question will arise regarding Jell. Did I see nothing of the various remedial forms of treatment of the wicked which other travelers have noted? I did not, except in one minor case. They generally were given up about one generation ago and passed out of use. The only survival is one for the treatment of wicked cephalopods and brachiopods. Both these groups of organisms are provided with resistant shells into which, after evil deeds on the surface, they retired with impunity. In Jell the wicked ones have been gathered by thousands into a vast pool of water. First acid is turned in on them and it dissolves the shells to their great discomfort while nourishing the tissues; then alkaline calcic solutions are let in which reproduce the shells while destroying the tissues and thus alternately these two reactions are carried out until complete repentance is produced and the head jevil can say, "Now will you be good."

Turning finally even from this interesting sight I retraced my steps to the point where I had entered, passed up through the zones of flowage and fracture, through the ground-water and vadose region and shot up out of the ground in the Tenderloin. No one paid the slightest attention to me, for everyone thought I was just one of the workers in the tunnels under the river who had been blown out by leaky air, an occurrence now so common that it no longer excites remark.*

THREE LEADING AUSTRALIAN GOLDFIELDS.—The figures for 1905 of the three leading goldfields on the east coast of Australia—Bendigo, Charters Towers, and Gympie—are now available, and they show that, as regards surplus of dividends over calls, Bendigo has to take third place. The figures are:

	Dividends.	Calls.	Profits.
Gympie	£195,875	£ 65,727	£130,148
Charters Towers	219,610	93,466	126,144
Bendigo	230,009	175,281	54,728

The figures in each instance show a shrinkage over those for 1904. In that year the surplus of dividends over calls at Bendigo was £199,802, the falling-off being no less a sum than £145,000. At Charters Towers during the same year the totals were: Dividends, £398,128; calls, £83,067; the surplus being £90,000 in excess of that for the past year; while at Gympie there has been a falling-off in the twelve months of £38,000 in the profits. The meteoric Queen's Cross reef has been one of the main causes of the supremacy of the Charters Towers field during the past two years, as in 1904 it paid no less than £200,000 in dividends, but in 1905 the amount dropped to £62,500. The Brilliant and Central dividends fell from £60,000 to £27,500, and Brilliant and St. George from £70,200 to £43,200; but Mills' Day Dawn United and Phœbe came on to the list with dividends aggregating £29,000. At Gympie two mines, the Scottish Gympie and the No. 2 South Great Eastern, were responsible for nearly three-quarters of the gold yield last year, and out of the total of £195,875 dividends earned they contributed £146,000. It is somewhat difficult to give the exact return per ton of ore at the three fields, as the Charters Towers mines are still dealing with accumulated tailing, but the approximate figures are as follows:

	Tons.	Oz.
Bendigo	353,880	215,000
Charters Towers	224 519	171,529
" (cyanide)	208,494	103,407
" (smelters)	.....	45,805
Gympie	213,454	132,403

The total value of the output at Charters Towers was £959,963, or £4 5s. 8d. per ton of ore.—*The Australasian.*

INTELLIGENT PROSPECTING should be based upon scientific principles, for a properly executed geologic map will define the areas within which there is a probability of finding a given kind of mineral deposit. The veriest tyro need hardly be told not to seek coal in a granite, nor would he ordinarily prospect for gold in a region of coal-bearing rocks. The geologist carries this classification of the rocks still further, and may thereby prophesy the occurrence of ore deposits in a region which he has mapped. The actual discovery of the ore is no part of the work of the geologist; this demands detailed examinations and often excavation, such as only individual property owners can make. This point is emphasized because, even among the well-informed, the question is often raised why the geologist does not more often discover mineral deposits. Lack of appreciation of the relation of applied geology to mining is traceable in part to the stories current of the bonanzas discovered by an accident to a mule, the luck of a tenderfoot or the appetite of birds, which are in the popular mind so interpreted as to throw discredit upon geologic science.—A. H. Brooks, in *Popular Science Monthly.*

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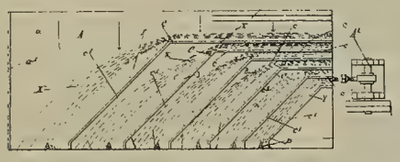
*A paper read at the dinner of the Journal Club of the Geological Department, Columbia University, on the evening of May 18, 1905.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 20, 1906.

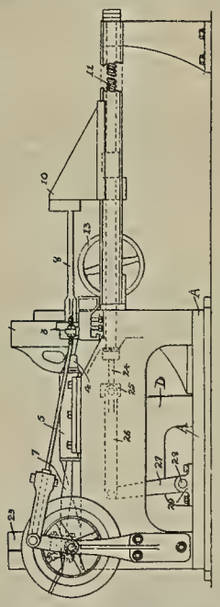
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ORE-CONCENTRATING APPARATUS. — No. 814,896; J. F. C. Abelspies, Charlestown, England.



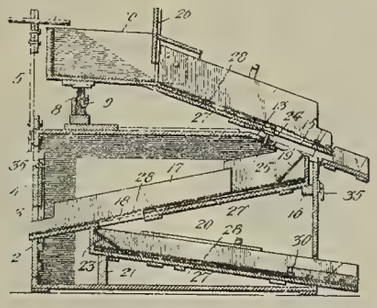
In concentrator, transversely inclined reciprocating table, feeding means extending along portion of upper longitudinal edge of table, longitudinal riffles extending transversely of line of feed for portion of table length, partitions extending from ends of riffles diagonally to lower side of table, and means at lower end of each concentrating-section formed by partitions for separately collecting grades separated by sections.

MECHANISM FOR SHAPING AND SWAGING ROCK DRILLS.—No. 815,845; W. P. Lightbody, Johannesburg, Transvaal.



A machine of character described comprising radially arranged swaging devices, rotatable cam ring for operating same, yielding device for reciprocating ring, an adjustable drill support, and connections between drill support and yielding device, whereby the latter is controlled by the former.

ORE WASHING MACHINE.—No. 815,853; A. S. Mitchell, Oakland, California.

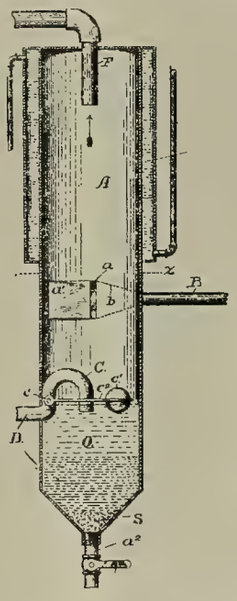


In ore separator, upwardly curved guideway, pivoted receiving trough having wheels arranged for travel on guideway, second trough arranged beneath receiving trough and adapted to receive material from latter, supplemental screen arranged in second trough and onto which material from receiving trough is delivered, and means within troughs for retarding passage of material therethrough.

METHOD OF TREATING MATTE.—No. 814,049; W. M. Johnson, Hartford, Connecticut.

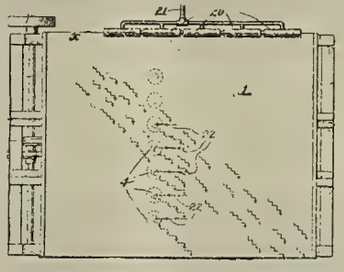
The herein-described method which consists in subjecting copper-nickel matte to the action of sulphuric acid, thereby dissolving nickel and liberating hydrogen sulphide, and leaving a residue consisting in part of copper sulphide; roasting residue to oxide and leaching same with sulphuric acid, thereby forming solution containing copper sulphate; electrolyzing solution to separate portion of copper; and returning spent electrolyte to leaching vats.

SEPARATOR FOR GAS, OIL, WATER AND SAND.—No. 815,407; A. S. Cooper, Berkeley, California.



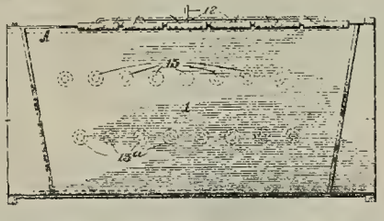
A separator for gas, oil, water and sand, comprising a cylinder, means for delivering material into its side tangentially to its circumference, to impart rotary motion to material, whereby constituents are separated, an exit for gas at the top of cylinder, an exit for sand and water at bottom of cylinder, and an intervening exit for oil automatically controllable by the level of oil.

CONCENTRATOR.—No. 815,679; H. H. Campbell, Steelton, Pennsylvania.



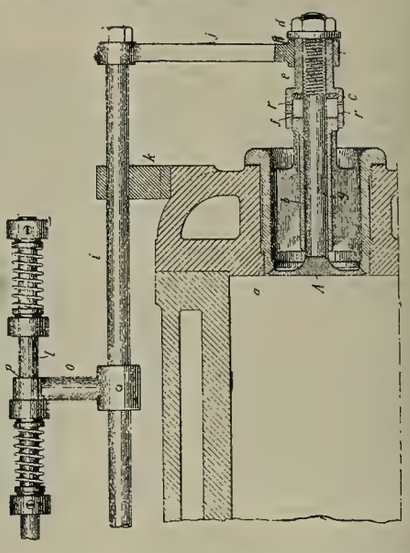
In ore separator, combination of slidable table, means for imparting reciprocatory motion thereto, means for imparting sudden bump or jolt thereto at end of its forward stroke, series of electro-magnets adjacent to table in a line at right angles to the line of reciprocation of the latter, means for effecting reciprocations of magnets reverse to those of table, means for magnetizing magnets at the end of their forward stroke, and demagnetizing the same at the end of their return stroke; together with means tending to advance the ore particles upon table in lines transverse to the direction of reciprocation of table and magnets.

CONCENTRATOR.—No. 815,673; Q. Bent, Lebanon, Pennsylvania.



In magnetic separator, combination of a support for material to be treated, a magnet, means for imparting reciprocatory movement to magnet, means for demagnetizing magnet at or near the end of its stroke in one direction, and means tending to carry off the material deposited on the support in a direction transverse to that of the movement of magnet, whereby the magnetizable particles of material deposited on support are caused to be transported across support partially by being carried by magnet in its forward stroke, and partially by momentum after being released therefrom.

VALVE FOR AIR-COMPRESSORS.—No. 815,488; T. E. Sturtevant, Dover, New Jersey.

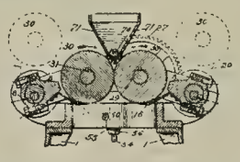


A valve mechanism for air compressors, comprising valve, valve-stem, and valve-stem journal, valve provided with air-cushioning means for retarding opening thereof, comprising cylindrical sleeve on valve-stem and co-operating abutment on valve-stem journal, tappet or operating-rod, connecting-rod, link or arm on connecting-rod having sliding connection with operating-rod, cushioning-springs on operating-rod upon opposite sides of link connection, and a second arm rigidly secured to connecting-rod and having sliding connection with valve-stem, whereby connecting-rod has free movement in one direction without operating the valve.

PROCESS OF TREATING NICKEL ORES.—No. 815,717; C. Langer, Ynspenllwch, Clydach, England.

A process for volatilizing nickel in form of nickel carbonyl, which consists in passing carbon monoxide over material containing finely divided nickel and keeping temperature of said material at between 40° and 50° centigrade.

CRUSHING ROLLS.—No. 815,332; A. C. Calkins, Los Angeles, California.



In ore crushing machines, yokes provided with bearings in ends of frame, crushing-rolls journaled in open ends of yokes, scrapers secured to the bearings, the equalizing bars resting on the roll ends of the yokes, and tension devices attached to frame and removably secured to the bars, whereby an equal elevation of the rolls is maintained during the operation of crushing.

EXTRACTION OF PRECIOUS METALS FROM ZINC ORES.—No. 815,614; A. R. Meyer, Kansas City, Missouri.

The within described process of recovering zinc and precious metals from zinc ores, the same consisting in forming an intimate mixture of comminuted ore and copper, and heating the mass to sublimate the zinc and form a matte or regulus containing the precious metal and the copper, and then separating the matte or regulus containing the precious metal from the residue and condensing the zinc fumes.

Special Correspondence.

LONDON, March 21.

In their report issued for the statutory (or first) general meeting of the Somera Gold Mining Company, Ltd. (Mexico), the directors state that the total number of shares allotted is 216,000 of £1 each, the consideration for the whole being cash. The amount called up so far is 5s. per share, or £54,000.

At the meeting, the chairman, Mr. R. T. Bayliss, gave, in his usually lucid manner, an account of the mining work carried out since the Company was formed. Considerable delay has been experienced owing to repairs having been required in the Somera shaft, which was left in bad condition by the former owners. The developments have also had to wait for the installation of air-pipes and ventilating plant. Preparations are being made at surface to sink a main three-compartment working shaft practically in the middle of the claim. It will have to be sunk to about 600 ft. before reaching the veins, taking probably from 12 to 18 months. The ventilation of the mine will not be perfect until this shaft is completed. The 486-ft. crosscut, after first encountering the East vein of the Esperanza series, was advanced about 125 ft. further, when it struck the West or main vein of that series on which the Esperanza Company have been working their high-grade orebody. A drift has been advanced on this West vein about 40 ft. north and 40 ft. south, showing a strong vein but of low value—only some $4 or $5 per ton. On the East vein a drift has been advanced 70 ft. south and 40 ft. north without meeting with anything of great importance, the values running from $5 to $11 per ton. Developments on the same veins at the 386-ft. level have yielded similar results. The chairman said they were now hoping to meet with at least a portion of the Esperanza west orebody in a crosscut now being run out at the 186-ft. level. So far they had not found a continuation of this orebody at the north end of their claim, but they were hoping still to discover something important in a southerly direction. The length of the Esperanza orebody is 600 ft., and in the Somera claim they had upward of 3,000 ft. still to explore on that vein. Referring to other veins in the property, the chairman said that Mr. Raymond had reported that although there was not much to boast of just yet, the mine was showing a noteworthy improvement.

The prospectus of The Parral (Mexico) Railway & Mining Corporation, Ltd., has made its appearance. The capital is in 300,000 5% cumulative preference shares and 200,000 deferred shares, both £1 each, and the issue includes £400,000 of 5% debenture stock. A sum of £100,000 for working capital is provided. There is what is termed "a strong board," and the reports and valuations of the properties are by J. Fletcher Toomer and J. Edward Capdeville, of Paris, both of whom were instructed by the vendors. There are 17 mining properties of an area of over 300 acres, with a total length on the vein of about 19,550 ft. Of these 15 are proved mines. The properties include mill sites, two mills, pumping and hoisting plants, usual mine buildings, and a tramway connection with all the mines on the Veta Colorada and with the mills and railway, with an equipment of cars for the economical transportation of the ore. The properties are sufficient for numerous companies to work, and after the necessary development work has been done upon the mines, they will be worked on royalties or sold for conversion into public companies. A concession granted to the Parral and Durango Railroad Co. will in due course be carried into effect for the construction of a line to Guanacevi. The capital stock of the P. & D. Railroad Co. is taken over by the new corporation, as also the capital stock of the Hidalgo Mining Company. The present combined railway and mining profits (about £38,000) are sufficient to pay the interest and dividend on the debenture stock and preference shares. The deferred shares go to the vendors as part of the purchase price, the total of which is £800,000.

The directors of the British South Africa Co. (The Chartered Company) have published the figures of revenue from all sources and expenditure as shown in the following table:

	Southern Rhodesia.	North-eastern Rhodesia.	North western Rhodesia.
Year ending March 31, 1905:			
Revenue	£456,385	£28,030	£20,002
Expenditure	590,139	90,512	59,664
Year ending March 31, 1906:			
Revenue, estimated	518,550	25,385	32,740
Expenditure, do.	531,349	60,885	87,421

The directors report that the mining industry continues to show satisfactory progress. For the 12 months to December 31, 1905, the output of gold was 407,048 oz., silver 89,278 oz., lead 570 tons and coal 97,191 tons. The output of gold for 1904 was 267,737 ounces.

The capital of the company to March 31, 1905, amounted to £11,502,415, made up of 5,999.361 shares of £1 each; premiums on shares issued £4,250,174, and mortgage debentures £1,252,880.

The Chartered Company was formed in 1889, having property extending over an area of about 750,000 square miles. It has never paid a dividend, the expenditure always exceeding the revenue. The shares have sold at over £8. The price on the market at present is £1 12s. The assets of the Company in London include a museum of Rhodesian antiquities and curiosities.

At the annual meeting of the Transvaal Chamber of Mines recently held, comparisons were given of the cost of Chinese as against Kaffir labor, with a view to disproving the argument that the Chinese were paid starvation wages in order to undercut the natives. This theory had received support, unintentionally, by the report of the Government Mines Department for the year ended June 30, 1905, wherein it was stated that the wages of Chinese averaged 33s. 6d. per calendar month, while those of Kaffirs were 52s., without making allowance for the fact that, under the ordinance, the coolies worked for the first six months after their arrival at 1s. per day. The following figures for the three months ended January 31 are given to show the real average comparative cost of each kind of labor:

	Chinese on Simmer & Jack.	Natives on Robinson Deep.
Average number employed	4,238	2,030
Average number working	3,767	1,738
Total number of shifts	291,398	145,061
Compound expenses (including time office expenses, but exclusive of any coolies' wages)	9.031d.	9.216d.
Labor supply, procuring, repatriation fund, passport fees, etc	7.297d.	4.217d.
*Wages per man	21.155d.	22.615d.
Total	37.483d.	36.048d.

*Average wage per coolie on the Simmer & Jack for 30 shifts being 52s. 10½d., and the average wage per native on the Robinson Deep for 30 shifts being 56s. 6½d.

The Kaffir share market shows some signs of recovery from the lowest depths, in spite of the threats dealt out by the extreme Radical wing of the Liberal party. According to the organ of that group among the supporters of the Government "more drastic methods" must be enforced "against the gang of impudent aliens who are running the Transvaal." Evidently sharing this view, the Under-Secretary for the Colonies explained the other day in Parliament that so soon as existing arrangements have ceased, instructions will be given to our consuls in China by which an absolute barrier will be set up against the enlistment of Chinamen for work in the Transvaal mines. Unless in the time fixed for the automatic expiration of the ordinance, the new Transvaal Assembly puts forward other proposals, the whole system of Chinese labor must fall to the ground.

A report has been received from Mr. Thos. Kassner on the property of Sanella Outcrop Reefs, Ltd., noticed in this correspondence on January 17. He has made a detailed examination of the reefs, and his conclusions are uniformly favorable. He estimates the yield of gold at 50s. per ton or £125,000 per claim, giving a total for the whole 912 claims of £114,000,000. On this he looks for a total eventual net profit from the block of £38,000,000. From which it would appear that there is still "corn in Egypt," a fact which will not fail to be noticed by the chosen people.

At the annual meeting of Mysore Gold Mining Company, Ltd., last week, the chairman, Captain W. Bell McTaggart, reminded the shareholders that although their nominal capital was only £290,000 there had been spent and paid on capital account close upon £1,000,000. What had they got for that million sterling? he asked—A surface plant perhaps as complete as any in the world. Every kind of engine, electrical power, shafts, buildings of all descriptions, and after paying dividends of nearly £4,500,000, they were left with ore reserves consisting of 613,000 tons worth more than twice the million sterling spent on the mine. On the Irishman's plea that posterity would do nothing for the present shareholders, the Chairman thought they should help themselves by raising fresh working capital instead of providing it out of revenue by a self-denying ordinance of diminished dividends. Although this sentiment was not entirely shared by the meeting, the proposal to create 50,000 shares of 10s. each and to issue them at a premium of £5 10s. was unanimously carried. Arthur Gifford, Mr. Hancock's understudy for some time, has succeeded that gentleman, on his retirement, as superintendent.

The Burma Mines Railway & Smelting Company, Ltd., has been formed with a share capital of £260,000, and an issue of £150,000 of 6% mortgage debenture stock, the proceeds of which will be employed in bringing the ancient silver-lead mines at Baudwen, Upper Burma, and a partially constructed railway, into a profit-earning condition. A novel feature of the flotation is the postponement by the owners of the mine of their entire interest until the debentures are redeemed or converted under option into shares. Messrs. Bewick, Moreing & Co., the general managers, estimate that the net profit to be derived from some 110,000 tons of slag ready for treatment, is £425,700—the operating cost being put at £6 per ton of lead. The average metallic contents of the slags are given as, lead 47.8%, zinc 16.7%, silver about 2½ oz. per ton. The numerous old workings in the mines are not now accessible to any great extent, but the great quantity of material extracted, the high tenor of the assays and the belief that the sulphide ore is practically intact, afford some indication as to what may be expected when modern methods are applied and the mines are properly opened up.

A dividend of sixpence per share has just been declared by Stratton's Independence, Ltd., payable on April 10. Two other dividends at the same rate have been paid since the close of the last financial year, June 30, 1905.

DENVER, April 1.

The Cripple Creek district deep-drainage tunnel project has been under discussion for a long time, and while there is a growing and pressing need for it, there is still disagreement among mine owners, as to ways and means. The problems of the area throughout which drainage will be effective, and the distribution of the cost of the adit, are yet unsolved. Another retarding factor, not so apparent but quite as real, is the time consumed in the strategy of the financiers; when they have the situation that will secure advantages and tend to avoid future entanglements, the work will be started. The latest plan for financing the scheme is that of a local engineer. He proposes that to raise the money required to drive the adit, those who produce the ore contribute an average of 25c. per ton, which, at the regular production of the mines, would yield $12,500 per month; this 25c. per ton is additional to the freight charge, also 25c. per ton, more or less, according to the gold content of the ore. It is doubtful whether this proposition will be taken seriously, considering the large amount of ore—say, 40 to 50%—that is mined under lease. The owners of the ground will be the sole beneficiaries of deep drainage and there are many in the district who think the cost of driving the adit should be paid by them in proportion to the acreage they hold.

On March 27 a large inflow of water flooded El Paso mine, on Beacon hill, from the 1,000-ft. level to the 600-ft. level, filling about three miles of workings in six hours. At the 600-ft. level the water is carried off by an adit. It is generally believed that above the 600-ft. level there are ore reserves sufficient to continue production for three years.

The building on Portland No. 1 shaft, covering shaft-house and machine shop, was burned on March 26. A mine-hoist and 36-in. stroke Ingersoll-Sergeant air-compressor were badly damaged, while the boilers were only slightly injured. The fire caused considerable excitement among the employees of the company; nevertheless, the management coolly and successfully directed the saving of the shaft and the adjoining buildings. The loss is fully covered by insurance.

The almost daily crop of new strikes reported by the press of Cripple Creek impresses the novice to some extent, perhaps, but the ultimate effect on mining is hurtful. The newspaper reports leave the searchers after truth doubting and perplexed, and must have turned aside more capital than has been thus attracted. The resources of the district are far from being exhausted, and good mines are developed with wonderful frequency. Among the recent developments, that of the Ophir mine, on the southern slope of Raven hill, is of more than passing interest. Good ore has been mined from continuous shoots, the ore becoming richer with depth, and to a marked degree at the 700-ft. level. At that level 100 ft. of drifting has been done, opening five feet of smelting ore, running better than the average grade of the district; along with this is a high-grade streak, 12 to 14 in. wide, of sylvanite and roscoelite ore carrying free gold. Pieces of roscoelite, showing but little metallics, sample 61 oz. gold per ton, and a sample of screening from this streak gave 161 oz. gold per ton. The mine has two rich ore-shoots. The Ophir is not stocked; but is owned by Mrs. J. J. Cone, of Cañon City and is managed by Henry P. Dahl.

The Crescent mine, under lease to the Bull Hill Mining & Developing Co., promises to become one of the big mines of the district. The ore was first found at 600 ft. in depth, by a crosscut from the shaft. It is a rectangular body of phonolite and andesite, 130 ft. by 80 ft., surrounded by basalt, which marks the limits of the ore. A stope is being carried toward the surface. About 80% of the entire mass is smelting ore, carrying nearly 1½ oz. gold per ton. Pending preparation to handle a large tonnage of ore, 398 thirty-ton cars have been shipped and about 30,000 tons more broken and left in the stope. Car-loads of screening, netting $4,600 each, have been shipped from this shoot.

CALUMET, MICH., March 31.

Conditions at the smelting plants in the Lake Superior copper district strongly substantiate reports from other sources regarding the urgent demand for refined copper from consumers. While the present indications are for an early opening of navigation at copper country ports, the smelters are rushing their product forward to the Eastern seaboard without delay. The Michigan smelter of the Stanton-Paine mines and the Calumet & Hecla smelter have broken all records in the matter of refined copper production lately. The Michigan smelter turned out approximately 7,500,000 lb. of fine copper last month and arrangements are being made for enlarged capacity. The Calumet & Hecla is operating extra furnaces at its smelter and shipping copper as rapidly as it can be turned out. Navigation at local ports is expected to open within two or three weeks, but the first lake steamers will find the wharves practically bare of the metal in marketable forms.

At the Winona mine, 11 drills are in commission. Of this number, four are in use sinking, two in each shaft, and the remainder are in use driving eight drifts. The drifts north and south from No. 3 shaft at the eighth level are in commission on alternate days. Drifting south at the sixth and seventh levels of No. 3 shaft, and north at the seventh of the same opening is under way. Drifting in No. 2 shaft is in progress at the seventh, eighth and ninth levels south.

There are some points in favor of the Winona resuming production, most important of which is the present price of the metal. It would be necessary however to install rock crushers in No. 3 shaft and provide rock bins there before shipments could be made. A railroad spur to that shaft would also be required. It is believed that the Winona's present reserves are of sufficient size to permit daily shipments of 200 to 300 tons of rock. There are facilities available for the operation of five more power drills, but it is probable that the compressor capacity would be increased if production were decided upon. This addition could be made at comparatively little cost.

Captain Samuel Robins and John Freeman are no longer connected with the Tamarack. Captain Robins left for the West, where he will be associated with a brother in mining work.

Some rich ground is being opened in the lower levels of No.1 and No. 2 shafts at the Mohawk, the average quality of the lode at these points being superior to that above the ninth level. Drifting south from the new No. 5 shaft also reveals productive ground. The Mohawk is shipping nearly 2,000 tons of rock daily now, No. 1 and 2 shafts being the main source of supply. The era of heavy construction expenses at the mine is over, but there will be small expenditures from time to time for improvements. Work at the stamp-mill is going forward. The steeple-compound head is treating 650 tons of rock daily. The other stamps will be changed to this type.

Another shaft will probably be started at the Champion mine next year. It will be situated south of E shaft. Drifts from the latter are penetrating the ground which will be opened from the new shaft and draining it of water. The drifts south from E shaft penetrated the strike-line of the new shaft some time ago and are being driven forward without interruption. Work there will be continued and the ground is part of the most valuable territory developed in the Champion mine.

No. 4 shaft of the Wolverine is making a creditable output and the increased rock shipments from that source largely offset the loss from No. 3, where the rock-

house was destroyed by fire a short time ago. Three shifts, working eight hours each, are employed at No. 4. It will be a matter of only a few weeks before No. 3 is ready to go into commission again.

The Lafayette Mining Co. has paid a dividend of $2.42 per share to its stockholders from the money received from the sale of the property in Ontonagon county, to the Copper Crown Mining Co. Another dividend will be paid, liquidating the affairs of the company. Essex Copper Co. has paid its stockholders $1 per share, the funds having been secured from the sale of its Ontonagon county mineral lands to the Copper Crown Co. Another dividend may be expected in the liquidation of the corporation. Neither of these concerns have done any work for several years, but the Copper Crown Co. proposes to develop the properties as rapidly as possible.

SALT LAKE CITY, April 3.

What will probably prove to be the most important mining litigation since the famous Mammoth-Grand Central case, is the suit filed in the Federal court at Salt Lake on March 31, in which the St. Louis-Magnolia Mining Co. is plaintiff and the Silver King Mining Co., David Keith and Thomas Kearns, president and manager, respectively, are defendants. Trespass and unlawful extraction of ore is alleged. Judgment is asked for to the amount of $900,000, or three times the actual value of ore claimed to have been taken from one level. The filing of this case has been expected for some time, and is the result of the refusal of the Silver King management to settle the claim out of court. The property of the plaintiff is situated almost in the center of the territory owned by the Silver King, and, it is said, the defendants gained access to the disputed territory by running drifts into it from the Silver King working shaft, and that some of the richest ore ever hoisted out of it was obtained from that portion of the vein involved in the dispute. The defendants admit having extracted ore from the ground claimed by plaintiff, but say they were entitled to it because of apex rights. The St. Louis-Magnolia Co. is sinking a shaft, which is now down about 145 ft., and has already encountered considerable ore. The properties concerned are at Park City.

At a depth of 25 ft. below the 700 level of the Cyclone mine at Stockton, a vein of solid shipping galena has been cut.

President Samuel Newhouse, of the Boston Consolidated Mining Co., has announced that as soon as certain deeds to the ground included in the site for the proposed 5,000-ton concentrating mill, near Garfield, Salt Lake county, are passed, ground will be broken and the work of laying the foundations commenced. It is expected that contracts for the structural material for the several buildings will be awarded within the next 30 days, as well as that for some of the equipment. While experiments are still being made at the $25,000 plant put up at Bingham for that purpose, it is practically a certainty that the ore brought to the mill will be crushed by stamps.

Development work has been progressing satisfactorily at the property of the Bingham Group Mining Co. at Bingham. A vein of lead carbonate ore, 25 ft. wide, has been opened, several feet of which is high grade. Albert Booth, of Bingham Junction, is manager.

The ore shipments from Park City last week amounted to 4,360,000 pounds, the contributors and amounts being: Silver King, 1,714,800; Daly-Judge, 1,057,000; ditto (zinc middling) 38,000; Jupiter, 16,000; Little Bell, 105,000; Daly-West, 1,150,000.

During the past week three new slime-tables were added to the equipment of the Daly-Judge mill at Park City: the three zinc-tables, installed recently, working in conjunction with the slimers, all but from one to two per cent of the zinc being saved.

The special meeting of shareholders of the Mammoth Mining Co., called to consider the matter of re-incorporating under Nevada laws with a capitalization of 400,000 shares of the par value of $2.50 each, has been indefinitely postponed. The company is incorporated under Utah laws at the present time.

The worst snowstorm of the winter occurred on the 1st and 2nd inst. The roads are in such deplorable condition that the movement of ore, where teaming is necessary, is accomplished under great difficulty.

The management of the New England mine at Bingham is receiving lumber for a new boarding-house. A contract will be let shortly for a new compressor. Henry M. Adkinson, of Bingham, is manager.

A special meeting of the stockholders of the South Columbus Mining Co., operating at Alta, has been called to amend the articles of incorporation, which will allow directors to levy assessments to the maximum amount prescribed by law. At present the levy is restricted to one cent per share every 60 days.

Shipments are being made from the Eagle & Blue Bell mine, of Tintic district, to the amount of 80 tons daily. This property is controlled by the Bingham Consolidated Mining & Smelting Co. The Bingham properties of this corporation, owing to the expiration of the contracts under which the ores of the Utah Copper and Cactus mines have been smelted, are being called on for an increased tonnage amounting to about 200 tons per day.

The management of the Utah Copper Co. has announced that it is the intention to commence the construction of the second section of the concentrating mill at an early date and that its completion will follow closely that of the first section. Contracts for all of the equipment for the first section will be let within the present month and the successful bidders will probably be requested to double the order. The officers' messhouse and dormitory, as well as the warehouse and machine shop, are practically completed.

Last week's shipments from the mines of Tintic amounted to 191 carloads, the shippers and amounts being: Centennial Eureka, 50; Ridge & Valley, 4; Eureka Hill, 20; Bullion Beck, 11; Uncle Sam, 5; Gemini, 19; Beck Tunnel, 8; Victor, 1; So. Swansea, 1: Victoria, 4; Eagle & Blue Bell, 12; Mammoth, 19; Lo. Mammoth, 2; Swansea, 4; Grand Central, 15; May Day, 5; Ajax, 5; Yankee, 2; Dragon Iron, 2; Brooklyn Con., 2.

The total ore and bullion settlements during the month of March, as reported through Salt Lake banks, aggregated the total of $2,080,550.

The Coffey group of claims, located near Shem City, in Washington county, have been bonded to Samuel Newhouse.

TORONTO, March 31.

Interest in the Cobalt mining camp increases as the season advances. The promised rush of prospectors and speculators has fairly set in, and, though the weather, up to latest accounts, has been such as to render effective prospecting difficult or impossible, the excitement is well maintained by reports of big strikes in the mines under operation, by company promotion and by speculation in real estate. Not a week passes without the launching of several new companies, most of which, in the opinion of practical men, are absurdly over-capitalized, considering the nature of mining operations in the Cobalt area; nevertheless, the shares of the most promising, or best advertised, propositions are rapidly being taken up. The promoter's opportunity has come with the practical exhaustion of the field for prospectors in the Cobalt area proper, the township of Coleman being virtually all taken up, though it is regarded as probable that many of the claims will eventually be disallowed as not being based on the discovery of valuable mineral, such as the law requires. Even should this be the case, the rush is so great that prospectors will need to go much farther afield. Attention is now being directed to the adjacent township of Bucke, where some promising prospects have been developed.

As intimated in a previous letter, however, the burning question among all interested in the future of the camp is the disposition which will be made by the Government of the Gillies timber limit—a large tract of mineral land lying directly south of Cobalt. This tract, which is heavily timbered with pine, is under license for lumbering purposes and consequently barred to prospectors. The timber license gives the lumbermen no claim to the soil or the minerals, but gives them the right to exclude prospectors or others. It is known to be extremely rich in silver, and by an agreement made with the licensees they have undertaken to remove the timber by October 1. Lately uneasiness has been excited by the widely circulated report that capitalists of Bay City, Mich., having obtained maps of the district, had secured the services of engineers, located claims covering the most promising veins and prepared papers to be filed as soon as the district is thrown open. Frank Cochrane, Minister of Lands and Mines, has reassured the public by stating that even had such proceedings been taken, it would not benefit the parties in the slightest or entitle them to any consideration in preference to others. He further set at rest the general expectation that the Gillies limit would be thrown open in the spring by stating that this could not possibly be done before October 1—the date set for the clearance of the timber—and that when the time for opening the tract for mining arrived everyone would be put upon an equal footing. As the position of the deposits is known to many prospectors, the ordinary method of locating claims could not be followed without serious consequences and a scramble that would result in endless confusion and disorder. It is therefore regarded as altogether probable that mining rights will be disposed of to the highest bidder, or that some other entirely exceptional plan will be adopted.

Prospecting in the Cobalt region has generally been confined to the Lower Huronian formation, in which nearly all of the more important finds have been made, and such indications as were found in the diabase have been regarded as of small account. As the monograph by Prof. W. G. Miller, provincial geologist on the cobalt-nickel arsenides and silver deposits of Temiskaming (published as Part II of the Bureau of Mines Report, 1905) pointed out, there are exceptions to the rule, several localities being mentioned, in which veins occur in the diabase. Recent experience has shown that some of these offer opportunities for profitable development. A diabase prospect, staked on a small calcite vein, a little west of a point on the railway between Cobalt and Haileyburg at a depth of 40 ft. shows a widening of the vein, which also assays well and gives indications of becoming a profitable mine. Tunneling operations at Diabase Mount, east of Peterson lake, shows that this formation overlies Lower Huronian, the plane of contact being practically horizontal. As the field for prospecting in the Lower Huronian is narrowed, the possibilities of the diabase will receive more attention.

A mining exchange has been established; the temporary quarters will be formally opened early in April. It is known as the Cobalt Open Call Mining Exchange, and is conducted on the Australian system, being open to the general public for buying and selling transactions in the evening, with private call meetings in the morning. The first 25 seats were speedily taken up at $50 each, the price being afterward raised to $100. Another evidence of the rapid development of Cobalt as a mining center is that the labor troubles, inseparable from modern industry, are beginning. A miners' union has been organized with the result that the secretary-treasurer, a miner from Montana, in the employ of the Nipissing Mining Co., was promptly discharged by the manager, who warned the men that the company would not retain in their employ anyone known to be a union man. It is said that an agreement to this effect has been arrived at among the mine-owners, who have also arranged a scale of wages, as follows: Miners, machine and hammer men, $2.25 per day; laborers below ground, $1.75; laborers above ground, $1.50, with board in each case.

Compressor plants are being installed at the Drummond and Jacobs mines in the Kerr Lake district. The machinery has to be hauled in from Argentite station on the Temiskaming and Northern Ontario Railway, half way between Cobalt and Haileyburg.

The position of Director of the Canadian Geological Survey, which has been vacant for some time since the death of the late Dr. Dawson, has at length been filled by the appointment of Albert P. Low. Mr. Low is a native of Montreal, and after graduating from McGill University in 1882 was appointed in the same year to the Geological Survey staff. His work for the past 25 years has been mainly in Eastern Canada, and he has made extensive explorations in Labrador and the country south and west of Hudson Bay. He commanded the exploring expedition of the *Neptune* to the north of Hudson Bay in 1904-05, and is regarded as one of the foremost Canadian geologists. Dr. Robert Bell has been acting director of the survey for some years, and in recognition of his services in survey and exploration work has been awarded the gold medai of the Royal Geographical Society of England.

Though owing to the Cobalt excitement, developments in the eastern mineral district of Ontario have not attracted much general attention. Steady progress has lately been made in the mining industries of Hastings county. A smelter is to be installed in the Eldorado Copper mine, now operated by the Medina Gold Co. The copper vein here was discovered beneath deposits of hematite ore. A shaft has been sunk to the depth of 160 ft. and the vein is found to have a well-defined width of 16 ft. Two carloads of the ore have assayed over 10% copper. The establishment of the smelter will make it possible to work a number of small copper deposits in the neighborhood, which have been lying idle.

BUTTE, April 1.

The East Butte Mining Co. now has ten sets of lessees at work in various properties, from the royalties of which the company has, during the last two months, derived a good net income, after paying for all development work, extensive improvements, salaries and office expenses. The lessees in No. 2 a few days ago cut, at a depth of 140 ft., a body of solid copper glance two feet wide; this is the same vein cut some time ago in the Symons mine of the company 300 ft. northwest of No. 2 at a depth of 200 ft. In the Symons, the rich streak is four feet wide. The company has completed its three-compartment shaft on No. 1 to a depth of 350 ft. The shaft was originally of two compartments, and was enlarged from the bottom to the top, the surface just having been reached. In the coming week sinking will begin from the 350-ft. level and a depth of 1000 ft. will be reached late in the fall. When a depth of 500 ft. is attained, a crosscut will be run to the company's lines north and south, and all the veins, about 21 in number, will be opened. The company will then begin stoping and mining from that depth to the present upper workings, giving from 200 to 250 ft. of stoping ground, which will make it possible to hoist and ship about 500 tons of ore daily. An encouraging indication is that the veins are widening with depth, and the copper glance has thus far been found in larger quantities. The new engine and compressor for the new shaft are expected to arrive daily. The company will build the new hoist over the old one, and will continue sinking with the old machinery while the new is being put in place. The plan is to sink another shaft at the extreme southern end of the company's ground and connect it by underground workings with the shaft on No. 1. The lessees are hoisting about 200 tons of ore per day, half of which is first-class and is shipped direct to the Washoe smelter, and the other is concentrating ore and goes to the concentrator of the East Butte Co.

By striking a rich body of ore in the Snoozer mine at a depth of 1,500 ft., the Raven Mining Co. enters the list of copper-producing companies. The company for several months has been developing the vein on the 1,200-ft. level and has taken out a lot of ore during the progress of development. While the work was going on on the 1,200 a crosscut was run from the 1,500 station which cut through one vein 30 ft. wide, and during the past week it cut another vein, known as the north vein of the Snoozer. The orebody at that point is 12 ft. wide and carries ore that averages the entire width 7% copper, 15 oz. silver and $1.50 gold per ton. Some of the ore runs 30% copper and 50 oz. silver. It is the same vein on which the Anaconda Co. is mining in the Mountain Consolidated mine, which has been worked up to the end-line of the Snoozer. In addition to the north vein, the company is drifting to the south, or discovery vein, both on the 1,200 and 1,500. On the 1,200, in the east drift, a fine body of ore four to six feet wide has been opened, and the east drift on the 1,500 is also in broken material, and the indications point to close approach to an orebody.

The report is that the Amalgamated Copper Co. will make extensions at its Washoe smelter in Anaconda, increasing its capacity, so that it will be able to treat all the ores that it is now handling and also those of the new Butte Coalition Co. and the United Copper Co., which will mean a suspension of operations at the smelter of the Montana Ore Purchasing Co., formerly the property of the United Copper Co., but now owned by Butte Coalition. The smelter is a comparatively small one and will not be able to handle all the ore that the Butte Coalition expects to mine.

Important improvements at the West Colusa and Leonard mines of the Boston & Montana Co. are being made. Work is in progress on a new steel gallows-frame at the shaft of the Leonard. The frame will be 152 ft. high from the collar of the shaft, the highest in the district. The new engine has not yet arrived but the foundation and building for it were finished some time ago. A station is being cut at the 1,500 ft. level of the West Colusa mine, and when that is finished the shaft, which is now down 1,600 ft. will be sunk 400 ft. deeper.

The discovery of rich copper ore at depths of 2,200 and 2,400 ft. in the Anaconda mine has prompted other companies to sink deeper, it having been demonstrated, beyond doubt, that there is apparently no limit to the depth at which good copper ore exists in the Butte district. The Anaconda Co. has opened three veins on the 2,400-ft. level, including the big one which was opened on the 2,200 about three months ago.

The Butte Copper Co. is shaping affairs for active work on the Emmet mines. The company will sink a three-compartment shaft 1,000 ft., the work to begin where the lessees quit some time ago, at a depth of 300 ft. At that point a large copper vein was cut.

The Butte & Bacorn Co. is making rapid progress on its three shafts north of Butte.

Mining Summary.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

C. E. Darling of Nome reports a rich strike on property owned by E. W. Johnson of Seattle and other strikes in the Nome district. The claim owned by Johnson is one of the richest in the district. A $2 pan can be secured anywhere in the workings, and on bedrock pans have been taken out that go as high as $300. The new strikes are not confined to this, and all of the available boilers at Nome have been pressed into service, working the rich diggings. Nome has had a great winter of mining activity. The Portland Bench claim will clean up about $1,000,000 for the winter's operations, and the property owned by Thomas Noyes of Seattle will probably produce $100,000 this winter. Solomon has shown up better than at any time since the first operations were commenced in that section and will produce $2,000,000. The Mystery mine on Solomon creek, owned by George Grigsby and a man named Loudan, will produce about $100,000.—The Gold Run benches are showing up well, and the reports from the Kougarok give that section the best strikes that have been made there.—Another good thing about the district is the marked change in the political situation. For the first time in the history of Nome the marshal's office and the United States judge are working in perfect harmony. —The Nome dock has stood up well under the winter weather.

ARIZONA.

Cochise County.

(Special Correspondence).—A discovery of rich gold ore is reported from the Elizabeth mine, in Paradise district. Ore assaying 2,800 oz. silver and some gold has been encountered in a vein 3 ft. wide at a depth of 20 ft. The group, of which the Elizabeth is one claim, covers 240 acres, and is three-quarters of a mile north of the town of Paradise.

The Tombstone Consolidated Co.'s mill has been closed down for a few days lately, pending arrangements for carrying off a large accumulation of water. Water has been accumulating for some time in an old stope of the Toughnut mine, and the pressure became so great last week that the water broke through the bulkheads and practically flooded the 100-ft. level.

A two weeks' run of the Commonwealth mill, at Pearce, has resulted in the recovery of 14 bars of bullion, aggregating 1,950 lb. in weight. The bullion is one-fourth gold, the balance silver, which makes the clean-up worth somewhat over $100,000.

Tombstone, April 2.

Two miles west of Johnson are rich deposits of wolframite. Up to the present it was recovered in the placers by means of rockers and dry washers. A majority of the claims, mostly patented, are operated in a small way by two Eastern firms which deal in the metal —Stein & Bouricke, of the Primus Chemical Co., of Primus, Pa., and Charles & F. E. Canda, of the Chrome Steel Works Co., Chrome, N. J. D. F. Halderman, a resident of Russellville, is manager for both companies. The tungsten concentrate obtained by rockers is distributed over several miles of surface, and Mexican laborers working the rockers are paid 10c. per pound for it on the ground. An average workman will wash out 20 lb. or over per day. This concentrate is in size from a grain of corn to pieces several ounces in weight and from 65 to 75% wolframite, beside carrying scheelite in considerable quantities. The value of this product f.o.b. Cochise is from 17 to 20c. per pound, and shipments of several tons per month are made. The ore occurs in pure white quartz veins in the granite and is easily traced along the surface for several miles. The vein matter will go as high as 30% wolframite. No work to speak of has yet been done on these ledges, as it has been easier to get returns from the placers and from rich float, which is being crushed by hand crushers in a small way. There are several other parties who own claims on the belt who are shipping in small lots.

Gila County.

(Special Correspondence).—The shaft on the Copper Hill mine, at Globe, has reached a depth of 700 ft., where a station is being cut. As soon as this is completed sinking will be resumed. The company has recently been shipping 100 tons of sulphide ore daily to the Old Dominion smelter, and some silicious ore to the Green Consolidated, at Cananea. At the company's Black Hawk shaft sinking continues, and has reached a depth of about 400 ft. Another 100 ft. will be sunk before more crosscutting is done. The crosscut at the 300 level has disclosed a 12-ft. vein of hematite, carrying copper and silver.

Globe, April 2.

Graham County.

(Special Correspondence).—A persistent report is again in circulation, through the stoppage of the erection of the new converters at the smelter of the Detroit Copper Mining Co., to the effect that the converters of the company will be removed and reducing the matte to ingots will be done at Douglas. It is believed to be the intention of the Phelps-Dodge Co. to concentrate their reduction works at a central point, and, owing to the situation of Douglas, that town has been chosen as the point where the works are to be located. Should this move be made, no appreciable effect will be produced on the number of men employed in Morenci, as the other improvements under contemplation, and already started, will increase the payroll.

The work of excavating the old slag dump here will proceed, and it will be treated to recover the copper still remaining in the slag, and the excavation will be filled with new slag and waste from the other departments.

Another move for the improvement of Morenci and surrounding country is the standardizing of the Morenci Southern Railway from Guthrie to a point as near Morenci as possible. From the Morenci cañon to Morenci it is impracticable, nearly impossible, to make this road a standard gauge, on account of the heavy grades and sharp curves. In this cañon, in a length of one mile, the railroad makes four complete loops, crossing over itself each time. However, the broadening of the gauge to within a mile of the town will bring shipping prices to a lower point. The organization of the new companies in this locality will make this change necessary for the handling of supplies and machinery when they start operations, and the present route seems the only legitimate inlet to this district.

Should the persistent report that the Calumet & Hecla people are back of the option taken on the Home Copper Co. properties prove true, this will mean the erection of new works, and possibly a new road from the Frisco and Gila side of the county, and the opening up to competition the different industries that this district can easily support.

The Arizona Copper Co. is demanding the ground now occupied by the lumber yard of the Detroit Copper Co., which will mean the removal of the sawmill to some more convenient point. Whether this point can be found in Morenci or not remains for the company to decide, and little information is obtainable. Already the Detroit Copper Co. scrap-pile, which occupied Arizona Copper Co. ground, has been removed under their order, and thus the entanglement has been straightened out.

On Sunday morning, March 25, a switch-engine of the Detroit Copper Co., with a steel car of slag, got beyond control, and, after making two loops on the Morenci Southern Railway, jumped the track at the third loop, and engine and car were completely demolished. The engineer in charge escaped injury by jumping, while two brakemen were badly injured, although no fatalities will result.

There is greater activity in and around this district than ever before in its history, and from the number of deals now pending it is more than likely that the Clifton-Morenci district will close the year 1906 with more mines in operation than at any time in its history, and will be not far behind Warren district, in which Bisbee is situated. Engineers from all over the country, representing Eastern as well as Western capital, are securing all the ground available. During the past week a number of options have been taken on several of the most promising claims in the Copper Mountain district. Also, about 25 claims were bonded, it is thought, by the same people who own the Calumet & Hecla property in the Warren district.

A new whim is being installed on the property of the Home Copper Co., in Gold gulch. The country surrounding this property is being taken up for miles around and every day shows the hills full of prospecters and claim hunters.

The Detroit Copper Co. is excavating above the sawmill for a large set of railway scales.

Morenci, April 2.

Mohave County.

(Special Correspondence).—Superintendent Spargo, of the Enterprise mine, in the Big Hualapai mountains, 15 miles northeast of Kingman, has been exhibiting some strikes of lead ore encountered in the east drift of the mine on the 100-ft. level. The orebody is over 3 ft. wide, and it is believed that one-half of the vein is of shipping grade.

The Chloride Gold Mining Co., at Chloride, has made a shipment of ore to the Needles smelter carrying larger values than any heretofore made by the company. Regular shipments to the smelter will now be made.

Kingman, April 2.

The Kingman *Miner* reports a discovery of rich placer ground in the Cedar Basin country, to the north of Rioville. The gravel is said to be extensive and the gold coarse. Many people are rushing in there. The Cedar Basin is on the east side of the Virgin range, north of the Colorado river. Last year some good veins were discovered and worked there. The ore was found to be gold-bearing. H. Gentry, of St. Thomas, and M. Redman, of Kingman, were interested in mines in that section. Mr. Gentry at one time had his properties under bond, but the parties failed to take the option, owing to lack of water and its isolation. Now that placer gold has been found there, means will probably be found to work them.

Arrangements are being made for the purchase and erection of a concentrating mill on the Vanderbilt mine by the Cerbat Mountain Mining Co., of which J. Boyle is general manager. The mill will have a capacity of 25 tons daily. The ore now being taken from the lower level will not have to be treated, being shipped direct to the smelter. Ore from the upper levels will be milled, the concentrates calcined and amalgamated. In this way a saving will be made in freight charges.

S. Fields has gone to Stockton hill, where he will look after the construction of the mill on the Banner group for the Arizona-Mexican Mining & Smelting Co. The mill is to have a number of new concentrating tables and will handle 40 tons of ore daily. At present there are about 2,000 tons of ore on the dumps that will be concentrated. Shipments of ore are now being made from the mine daily, the stopes furnishing about one ton of shipping ore to three tons of mill stuff.

CALIFORNIA.

Calaveras County.

Articles of incorporation were filed the past week at Sacramento, by the Princess Tin Mining Co.

The directors and principal holders of the stock are C. F. Hines of San Francisco, G. O. Pearce of Murphy, and A. B. McCaw of Tonopah.

Inyo County.

O. Neylon has given an option on his mines northeast of Bishop to W. D. Clair. Mr. Neylon has been developing these claims for the last 15 years. It is estimated that at least $15,000 worth of development has been done. The mines lie in a compact group, situated a mile northerly from the Southern Belle, at a somewhat higher elevation and on the same mineral belt. Large ledges crop out on the Neylon ground, one measuring 100 ft. in width, and averaging $9 per ton in gold. Another is 23 ft. wide. Ore of much the same general character is found in all the claims—an oxidized quartz, carrying gold and free-milling. The walls show copper stains, and the same stain is found to a limited extent in the ore.

One large ledge crops out the full length of two claims, 3,000 ft. Assays taken along its entire distance range from $8 to $17. Near the lower end, across the claim is a natural cut 800 ft. deep. This ledge shows all up and down its face. A crosscut tunnel is in 650 ft. in this ground. At 400 ft. depth this tunnel struck a ledge 36 ft. across.

The situation is favorable for economical working. An ample water supply, fully protected by locations, is not more than three-quarters of a mile distant, and milling can be done at a cost low enough to make the values given profitable. The property is easy of access by wagon road, already built almost to the ground.

A. L. Wells and H. E. Parker have found rich silver-lead ore on locations made by them near and south of Redding cañon. There are said to be two ledges, 18 in. wide, traceable on the surface for a long distance. They also had some gold-bearing ore from the same neighborhood.

Modoc County.

(Special Correspondence).—The Hogue Mining district was organized March 29, 1906. The most important points of this new strike are located in the northeast corner of California extending into the northwest corner of Nevada. The first gold prospects in the district were found years ago and were mentioned in the field notes of the government survey. Active operations were begun last August by half a dozen prospectors at about the same time. Most of the work was done from one to three miles south of the Oregon and California line and 10 miles west of the Nevada line and resulted in the finding of five or six outcrops of ore.

Among the most important was a large dike on the main divide, west of Mount Bidwell and one mile south of the Oregon and California line. The dike is a light, porous porphyry full of blebs and small cyrstals, the lighter parts resemble pumicestone. On the surface the valuable mineral is concentrated in seams, and the soil on the hillside, below the dike outcrop, pans fine free gold all the way down the slope and along a small stream to Cave lake, a distance of one mile. Cave lake has no visible outlet. Samples taken from the surface cuts and shoots show from $4 to $40 gold per ton. This is a general statement derived from the results of 150 samples carefully taken and assayed. This dike has a general trend north and south and makes a contact on the west with a rock thought to be phonolite.

Last fall several prospectors were working three miles south of the dike on a small quartz vein in porphyry. Samples from one-half ton of sacked ore taken out last September assayed $207 per ton. About 94% of the gold was free. The vein was prospected to a depth of about 12 ft. before snow fell.

The best strike in the district was made on a contact a little to the east of the first two mentioned locations. The ore is mixed quartz and iron, with some spar, and specimens assay $700 to $2,000. This location is on comparatively flat ground, and the formation is not well understood. The discovery hole is 18 ft. deep. No ore has been shipped. The ore and formation here is described as resembling somewhat that at Goldfield, Bullfrog and the Kawich range. The ore here contains more quartz; otherwise they are nearly the same. The surface prospects well over large areas. Notwithstanding the show of free gold on the weathered talus, from the big dikes it is predicted the ore will become base with no great depth. However, the general appearance of the country is more inviting than the Nevada desert, owing to the presence of plenty of timber and water.

Two other discoveries a little south of the former three mentioned promise orebodies 4 to 12 ft. wide. The latter outcrops for 500 ft., assays showing from $12 to $25 per ton. The ore is comparatively hard and carries some galena and copper sulphides.

Specimens of tellurium ore from this location run from $150 to $300 per ton. These discoveries mentioned are located on the main divide, between Goose Lake valley and Surprise valley, at an altitude of 8,000 ft., and are best reached by following the south slope from Fort Bidwell, a distance of eight miles, by wagon road and trail.

Surprise valley is 50 miles long north and south, and has an altitude of 4,500 ft. Fort Bidwell is located at the extreme north end of the valley, and is well supplied with produce, grain, hay and fruit, is well timbered and watered. It may be reached from Reno by the narrow-gauge railroad to Madeline, and from there, 90 miles, by stage to Fort Bidwell.

The snow this season is from 6 to 10 ft. deep at the summit, which is quite unusual. The roads are bad, and it would not be advisable for those contemplating coming in to come until May 1.

Fort Bidwell, March 30.

Nevada County.

The Lecompton mine, near Nevada City, has been bonded to F. S. Mayhew of the Oroville Dredging Co. and E. P. Vandercook of San Francisco, who will open the property at greater depth. R. S Specht is superintendent.——A new mill and cyanide plant is to be in operation at the New York-Grass Valley mine in Grass Valley district.

Sierra County.

(Special Correspondence).—Work at the mine, owned by the Forest City Mining Co. (known locally as the Mabel Mertz mine), is being prosecuted under the management of H. B. McCormick. Last summer and fall the company erected a new boarding-house and other buildings on the property, and made numerous other improvements. The property is now well equipped, and possesses all of the facilities necessary to the proper operation of a placer or gravel mine. The main tunnel is being pushed ahead with two shifts. The company owns 6,000 ft. of the old Nebraska channel that it has been endeavoring to open up for some time. The first tunnel was found to be too high. A portion of the new tunnel was run through hard rock, and as it was necessary to run 1,500 ft. to get under the channel it has required considerable time. The Nebraska channel, wherever it has been worked, was rich, and the Forest City owners expect to be washing out gold within a short time. The necessary dumps, reservoir and other

apparatus for washing have been installed in order that no time will be lost in putting the mine in full operation as soon as the pay channel is opened up.

Downieville, April 2.

The Bullion mine, formerly the Collombo, is reported sold. It is situated close to the Sierra Buttes mine. The new owners are Los Angeles and San Francisco men, who have incorporated under the name of the Royal Quartz Mining Co. A contract has been let for the clearing out of the main tunnel, and plans have been drawn for a mill. It is estimated that the ore can be mined and milled for $2 per ton. The mine is a tunnel proposition. The ledge is from 3 ft. to 12 ft. wide, and mills $7 to $12 per ton.

San Bernardino County.

The new mining camp, 20 miles southwest of Needles, has been christened Sunrise. The district, since its first exploration some years ago, has been known as the Sunrise Mountain district, because it lies upon the north slope of the Sunrise mountains. Some years ago a shaft was sunk to a depth of 120 ft. on the Monumental group. From this shaft the present water supply for the camp is taken. The property has been idle, although parties have examined it, but there has always failed to be a transfer, although the reports show the property to have good orebodies. A little farther to the north and nearer Needles, a shaft was sunk some years ago but they failed to find payable ore.

A few months ago C. H. McClure discovered a quartz ledge. Hornings showed it to contain gold. Assays showed better results. This property was located and developed to a depth of 30 ft. Assays have run up into the hundreds of dollars per ton. The claim was named the Gold Dollar. The ledge was illy defined at the surface but with sinking it has developed from a ledge of a few inches to nearly 3 ft. at the bottom of the shaft. The ledge is well defined and dips into the mountain. The ore is white quartz, showing copper and iron stains and here and there particles of galena. There is nothing peculiar about the prospect except that the ledge seems to be divided near the center with a regular streak of finely pulverized, dark-brown substance several inches in width and it is this streak that has carried the higher values from the surface down. It was this property which brought the section to the attention of the public. There resulted an influx of prospectors, and many other good strikes have been made. Mr. McClure located several other properties, and has two groups, upon both of which good ore is found. A great amount of float quartz covers the north slope of Sunrise mountains and an examinatiion of the float shows a similarity in grade and character to that in the veins. Ernest Yarborough, a partner with Mr. McClure, is prospecting the claims and is making further discoveries daily.

M. L. Shackleford recently located some lead croppings. But little work has yet been done. The lead is associated with dark-colored spar. The croppings are regular so far as they can be traced. B. L. Vaughn, of Needles, is interested with Mr. Shackleford in numerous mining claims in the district.

W. A. Brooks, who is interested in properties in San Francisco district, near Vivian, in Mohave county, Arizona, has a camp at Sunrise and has opened a body of high-grade lead ore.

A. M. Wilkinson and T. Nay have a camp and a number of locations which show good croppings. Their work to the present time has been prospecting, as nearly everywhere else in the district, and they have uncovered some fine-looking ledges of lead ore, which they will develop.

Tuolumne County.

At the Los Angeles mine several miners are doing development work, the greatest difficulty being in keeping the water out.——Sinking at the Blackhawk near Soulsbyville is progressing under A. C. Glynn. A. A. Irish, of Los Angeles, is the principal owner.——The pump at the Louisiana mine near Carters has been running continuously. A large amount of old timbers and lagging have been encountered in clearing out the shaft. ——At the Spring Gulch good ore is being taken out, and this week the mill will be started. The owners anticipate a better clean-up than was made last time.——At the Grizzly and New Albany mines near Carters the company is doing development work, and the mill is kept busy day and night. There are 25 men employed at these properties.——At the Soulsby mine the Bagdad-Chase Gold Mining Co. has found excellent ore, but the mill will not be started until the mine has been more thoroughly developed. Over 40 men are employed. Preparations for unwatering the Davidson shaft are progressing. A six-inch Dow pump will first be used. After the water has been sufficiently lowered a 10-in. Cornish pump will be installed. This will be operated by means of power supplied from two new boilers. Work was commenced last week on a large gallows frame. At the Pennsylvania shaft a station is being cut on the 500-ft. level. The machinery formerly at the Bown mine, near Tuttletown, has been purchased and is being hauled to the Soulsby. W. Darlington is manager.

At the Maddox mine near Confidence, development shows the vein to be growing larger as the tunnel was driven ahead, and in the face of the adit last week the quartz showed ten feet wide milling ore, with a pay streak of high-grade ore. Everything is ready at the Confidence for the summer run. Wood has been cut and will be delivered as soon as roads are in condition to permit hauling. The cyanide plant will be started up early in April. The mill, which has also been idle since fall, is to begin crushing when fuel commences to arrive. Fifteen miners are at work.

Yuba County.

F. E. Wright, of Rackerby, says the Rackerby district is experiencing a revival. He has a bond on the Santa Rosa mine, one mile from the town of Rackerby, and has re-bonded it to R. W. Correll, of San Francisco, who has re-opened the old works, and intends to remodel the five-stamp mill and start the mine running this month if the weather will permit. Mr. Correll has also re-bonded from Mr. Wright the Abbott mine. Work will commence upon it at the same time as at the other property. The Santa Rosa mine has 800 ft. of tunnels in ore. The tunnels have been re-timbered and put in shape at a cost of about $800. The Abbott mine has two shafts down, respectively, 40 and 20 ft., but the ledge is large.

COLORADO.

Clear Creek County.

R. C. Bonney, president of the Chamber of Commerce and manager of the Sun and Moon mines at Idaho Springs, says that Idaho Springs is to experience one of the most active mining periods in its history.

Several important strikes have been made in the tunnels within the past few weeks. Sam Newhouse has decided to drive the Newhouse tunnel to completion. S. A. Knowles, who was in charge of the tunnel for a number of years, but who went to Montrose on the government tunnel, has returned and will again have charge of the work.

The tunnel is now into the Clear Creek-Gilpin belt over three miles, and an additional mile will take it under Quartz hill and the Eureka mine, the objective point of the tunnel.

To reach the tunnel from the Eureka mine in Central City a shaft over 1,600 feet in depth will be sunk.

The tunnel has not been advanced for over a year, but development work has been continued, and extensive lateral tunnels have been extended on both sides of the main tunnel. The Saratoga Development Co. and the Sun and Moon Co. are driving laterals eastward, while the Old Town, Gem, Addudel, Queen, Jackson Leasing and Orr have driven laterals to the west.

Mr. Knowles will have charge of the work for the tunnel company and he contracts the driving of the bore in two sections, the first of 4,000 feet, with privilege of 2,000 feet more, or until the Eureka vein is encountered at the greath depth. He will put three machine drills at work in the breast and push ahead with all speed.

The Lucania tunnel has struck good ore: the Two Brothers has opened an ore-shoot that is expected to produce largely. The Burns-Moore in the Ute creek section has crosscut a vein of high-grade gold and silver ore equal to anything that has ever come from its neighbor, the Lamartine; the Shafter vein in the Big Five Central tunnel is proving satisfactory; at the Hoosac its first vein was cut last week; the Rockford bore has passed through a cross vein of smelting ore.

Mr. Bonney expects to do diamond drill work on the Sun and Moon mines throughout their surface workings and also in the Newhouse lateral at a depth of 2,000 ft. In addition to prospecting his property with these drills, Mr. Bonney says that John Owen of the Saratoga Co. will connect the Newhouse lateral with the ninth level of the Saratoga mine. The Saratoga is filled with water, and, rather than begin a raise, with its great danger, Mr. Owen will use a diamond drill to connect the two points, which are but 400 ft. apart. R. B. Morton of the Jo Reynolds mine also expects to use a diamond drill for prospecting parallel veins.

A report is in circulation that the Terrible mine and mill is to pass to B. B. Lawrence of New York and J. H. Robeson of Georgetown. The Terrible property has been undergoing development during the past two years, with the result that a number of important discoveries have been made. During the past three years men have been cleaning out and re-timbering the levels and drifts. New pumping machinery was recently installed, and the water has been removed down to the deepest level. The shaft is now being sunk an additional 100 ft., and it is found that the ore-shoot is continuous.

Gilpin County.

Jones & Jones, of Central City, report a strike on the Perrin claim, in Russell gulch, south of the Topeka, at a depth of 150 ft. in the shaft, and have opened up four feet of milling ore, with six inches of a smelting streak which carries over $100 per ton. The ore shows copper and iron sulphide.

Chicago men have become interested in the Faraday Mining Co., owning the Faraday claim and having a lease and bond on the Argo, in Russell gulch east of the Alva Adams. The Argo is down 150 ft., but is credited with producing over $40,000 in gold. Grading has been started on the Argo for the erection of a shaft building, and Thomas Cudahy, manager, says that they will put up machinery capable of hoisting from 800 ft. The shaft will be sunk another 100 ft. as soon as machinery is placed.——Articles of incorporation of the A. A. Johnson Mining and Leasing Co. have been filed with A. A. and Clarence Johnson and Halsted L. Ritter of Denver as incorporators. This company has a lease and option on the Pendleton claim and mill site in the Russell district for three years. A new building is going up on the property and machinery is to be installed.——Sinking operations have been suspended temporarily at the Gibson shaft of the Esculapian Gold Mining Co. in lower Russell district, at a depth of 400 ft., while crosscutting north and south for the Gibson and Star of the West veins.

Lake County.

A large body of silver ore carrying 280 oz. of that metal and 30% lead per ton was opened up last week in the bottom of the Mammoth shaft, in Big Evans gulch, by the Citizens' Mining Co., under the management of A. B. Bohn. The ore was encountered under a cap of low-grade iron ore. The extent of the shoot has not been determined. The discovery was made in a new section of the camp, and means the extending of the known limits of the ore zone materially. St. Louis parties are heavily interested in the property.

Teller County.

Two of Cripple Creek's leading companies were overtaken by misfortune last week. One of the principal shaft-houses of the Portland Co. was destroyed by fire and the costly hoisting and other machinery seriously damaged, involving a loss of about $150,000, practically covered by insurance, and it is expected that the damage can be repaired in from three to four weeks; and since the company has two other shafts, the interruption to mining and development operations will not be serious.

The second misfortune promises to be more serious. In driving the drift at the 1,000-ft. level of the El Paso Co.'s mine a heavy flow of water was struck, which quickly drowned the pumps and rose to the level of the drainage tunnel from which it is flowing at the rate of nearly 3,000 gal. per minute. The El Paso management had felt secure against any such happening, for the reason that the 800-ft. level has been dry from end to end, although over 200 ft. below the general water level of the Cripple Creek district. It has been assumed that a certain dike acted as a barrier, and this was depended on to protect the workings to the greater depths. It is possible that a water pocket only has been tapped, in which case the workings can in time be pumped out; but if the flow comes from one of the main water courses of the district, the situation is a serious one. In the latter case it is quite possible that the economical draining of El Paso's lower levels may have to await the construction of the new drainage tunnel. There are ore reserves and unexplored territory above the water level, but with the lower workings remaining flooded the production of the property must be largely curtailed.

Brown & Co., who for the past year has been treating the tailing dump in the National mill, has secured a lease on the tailing dump of the El Paso mill. As soon as the machinery can be repaired the work of treating the tailing will begin. The dump contains 5,400 tons, and will afford six months' employment. The National dump consists of 16,000 tons. The sand is to be treated by a leaching cyanide plant.

IDAHO.

Shoshone County.

(Special Correspondence).—The Bunker Hill & Sullivan Mining Co. is planning to re-work its tailing piles. The company recently installed a small plant upon its dump at Kellog, and the process seems a success, although according to Manager Stanley E. Easton, the experiments are as yet incomplete and no definite results have been attained. The plant is operated by three men, and consists of jigs, which separate the lead ore from the lighter waste. The product from the jigs is then ground fine and reconcentrated in the usual manner. The company has on its dump 1,000,000 tons of tailing, and if the experiment proves successful, a large plant will be installed.

Wallace, April 1.

R. B. Bohannon has been granted the privilege by the city council of Wallace to establish a plant for working tailing in the south fork of the Cœur d'Alene river through that city, for which he is to pay $450. Mr. Bohannon is to complete his work within two years, if possible—he asked for three—and at the expiration of that time, if he is not through, he is to have the first option to continue another year. George Banister, who for some time has operated a tailing plant above town, bid for the permission; but his bid was $50 less than that of the successful applicant. The working of tailing along the streams upon which concentrators are situated has grown to be an important industry in this country. It is claimed that 10% of the values get away. By damming the stream at intervals, allowing the mineral particles to settle, and by installing a system of jigs, it is claimed a good portion of this lost wealth can be saved. Official returns show that of the output of the Cœur d'Alene last year, the five tailing plants produced net over $25,000. In the river the tailing deposit is from 4 to 7 ft. deep, and in places rich.

MISSOURI.

Jasper County.

Rich strikes have been made on the zinc properties of the International Power Co. within the last few days, and the representatives of this company are purchasing all the surrounding properties. Ground has been broken for the largest concentrator in the district, and shaft-sinking begun for three double compartment shafts. All adjacent properties have increased in value since these strikes were made.

MONTANA.

Beaverhead County.

H. H. Armstead, who is interested in the Silver Fissure Mining Co., which is handling the Polaris property, arrived in Dillon this week from New York, is now at Redrock looking after business for the company. Work is to be immediately resumed at Polaris and installation of a smelting plant is to be pushed. A good deal of the necessary machinery for the smelter is at Polaris. The work on the road, over which traction trains will be run, will be resumed as soon as the frost is out of the ground.

Broadwater County.

New development at the Custer group, near Winston, has been pushed, the old shaft having been sunk 200 ft. and a new shaft sunk an equal distance, and crosscutting commenced. New machinery has been placed and the shipments, beginning April 1, will be doubled, reaching 3,000 tons a month.

J. P. Woolman and Mr. Edwards, of Helena, have purchased the dump of the Bald Mountain mines from Thomas Cruse and will work them with a new 150-ton cyanide plant. There are about 75,000 tons of tailing which assays from $3 to $7 per ton. Work will be commenced on the new plant immediately.

The East London Mining Co., recently incorporated, will develop properties four miles south of Helena.

Fergus County.

There will be much activity in the Zortman district in the Little Rockies this season. The Fergus Co. has 10 claims on the west side and has done extensive development work, and will put a 100-ton plant on the property this season. The Ruby Gulch, which has been a large producer, sending in the vicinity of $20,000 per month to the Helena assay office, has, during the winter, enlarged its plant, beside doing extensive development work. It is reported that the Pappoose Co., in the same district, is contemplating the building of a plant.

Jefferson County.

During the week representatives of the German stockholders of the Cataract Mining Co., whose mines, smelter

and concentrator are near Basin, have been examining the properties. The mines of the Cataract Co., principal among them being the Bullion, are producing more than can be handled by the reduction works.

There is much activity in the old Wickes-Corbin district this winter, and more properties will be worked there than in many years before. Martin Mulvahill, who recently secured control of the Minnesota, has sunk the old shaft to 275 ft. and will sink another 100 feet.

Park County.

At Cooke City the transformed Republic smelter has been bought by the Buffalo-Montana Reduction Co., which is to treat ore from the Great Republic group.

D. Noble, one of the few pioneers of the camp, says that G. B. Allison and associates, of Seattle, will construct a 25-ton smelter one-half mile out of Cooke City, on Soda Butte creek, which will treat custom ore. In proximity to the Daisy group, Prof. Tanzer and associates, of Seattle, are erecting a smelting plant, consisting of amalgamation, concentration and smelting for custom ore. The National Park Gold Mining Co., a Montana organization, with home office at Great Falls, is preparing to take advantage of the custom treatment. Z. Daniels and associates will supply the iron-gold flux — in fact, it is reported that 60 properties are engaged in preparation for the coming year's active bullion production. At no time since the '80s has there been such substantial evidence that the Cooke City camp will be one of the great mineral producing camps in the northwest. There are 400 souls in the camp — 50 women and children and 350 miners.

NEVADA.

Esmeralda County.

A discovery of cinnabar is reported from Goldfield in the Goldfield-Brooklyn mine, in the northeast corner of the district.

In Bullfrog district, on the Transvaal claim, 15 miles northeast of Beatty, it is reported that surface prospect samples assay from $30 to $182. For 50 ft. in width and 200 ft. in length the pay-shoot has been determined.

Lincoln County.

(Special Correspondence).—Considerable activity has been occasioned in this camp by the visit of L. L. Patrick and party from Goldfield; also Matt Hoveck, superintendent of the Montgomery-Shoshone mine of Bullfrog. Both parties examined several properties in the district and acquired interests in the Cyrus Noble extension. They have also taken bonds on several other properties.——At the Le Roy the entire shaft is being retimbered. In the drift on the third level a large body of free-milling ore has been cut east of the main shaft. A new electric pump of 25,000 gal. capacity is to be installed and sinking will be continued.——The Quartette Mining Co. has let a contract to sink a vertical shaft 250 ft. on their Bay State claim.——The mill of the New Era Mining Co. resumed operation this week on ore from the south raise. It plates $20 per ton.——The Southern Nevada Co. mill will resume operations during the week. The mine has been developed to the 250-ft. level, but work has discontinued on account of water. Ore is now being taken out from a shaft sunk on the east-west vein.——The bottom of the main shaft of the Searchlight Treasurer is now all in ore. This shaft, which was started at a 45° dip, following the ledge, is straightening up. Considerable copper-stained quartz has been struck at 50 ft., which runs $42 per ton.——The Parallel shaft is nearing the 500-ft. level. Superintendent T. D. Forney has a full force throughout the mine, and in addition to sinking, drifting and crosscutting is being done. ——The shaft of the Venus is all in ore; contracts have been let to sink to the 400-ft. level. Stations are to be cut at the usual intervals, and a 15-h. p. hoist will supplant the whim now in use. Drifting east and west will be continued on the 100-ft. level to determine the length of the orebody.——While sinking for water on the Waterspout claim, close to town, considerable copper-stained ore, heavily mineralized, was struck at a depth of 190 ft. Drill samples assayed $44.80 per ton in gold and silver.——At the Cyrus Noble mine the new mill is reported giving excellent results and preparations are being made for a new 40-h. p. hoist, upon the arrival of which the force of 60 men now employed, will be materially increased.

Searchlight, April 1.

Lyon County.

The Federal Co., in the Como district, has men employed in preparing for an active campaign. Enough ore is blocked out to keep the milling plant in operation the next four years. The present plant consists of eight stamps and two roller crushers, and 10 more stamps are to be added, giving a daily capacity of 75 tons. The plant is operated by electric power from the plant at Floriston, on the Truckee river.

Nye County.

(Special Correspondence).—There is an excellent opportunity for a custom mill in Manhattan camp. All of the mines that are being worked seriously excepting the Manhattan Consolidated, are in the hands of lessees, who ship their ore at heavy expense. There are water and fuel to be obtained, and a 10-stamp custom mill would find more than it could possibly do at a good liberal price for treatment. The ores are thus far free milling, and apparently easy of treatment. One set of lessees has made a good clean-up by scraping up the loose float and débris that had naturally drifted down upon it from a claim on the hillside above. Good reports continue to come in from Round Mountain and Jefferson cañon. The hills hereabouts are full of prospectors, though prospecting is slow and uncertain owing to the north slopes, and some of the south exposures as well, being covered with snow.

The ore deposits are found to conform closely to the bedding planes of the enclosing rocks, and although sulphides are scarce in the district as yet, the porous, honey-combed iron gossan indicates what may be anticipated in depth. The prices asked for property are naturally out of all proportion to their present real value, but the speculators who are in camp watching developments seem willing to take a chance. There has thus far been no trouble in floating stocks in Manhattan mines, and the public, in this way, is furnishing the sinews of war to develop Nevada's newest gold camp.

Manhattan, April 2.

A new strike is reported at Round Mountain, about six miles east of Manhattan.

White Pine County.

The Ely Central Copper Co., of Philadelphia, capital $12,000,000, has been incorporated at Dover, Del., to acquire mines of copper, gold, silver and other metals and ores to mine, mill and refine the same for market. John W. Woodside and Frank M. Wirgman, of Philadephia, and B. A. Hazel of Smyrna, Del., are the incorporators.

OREGON.

Coos County.

The Wolverine & Western Development Co. was organized at Laurium, Michigan, last week, the promoters being Calumet and Laurium people. The incorporators are J. T. Fisher, F. J. Kohlhaas and J. Vivian, Jr. The company is organized under the laws of Arizona. The property is on the boundary between Douglas and Coos county, and consists of eight full claims. The calculation is that six months will be required to determine the exact conditions and outline a future policy for the undertaking. The property is opened by a tunnel penetrating two veins 60 ft. below the outcrop.

SOUTH DAKOTA.

Custer County.

On the Detroit claim, of the Ivanhoe company, near Custer, an open cut has been run 64 ft., showing a face 18 ft. high on the three-foot vein. The vein is running toward the Chilkoot orebody. Assays show an average of $15 per ton, and it is possible to handle this grade of material at a profit. The company is building a trestle and chute from this opening to the mill. The east drift from the 200-ft. level of the main shaft is being pushed to tap the Detroit vein. The mill is being run partial capacity, its operation being curtailed on account of a shortage of water.

Lawrence County.

In Deadwood gulch below Central City, and below the early-day sites of not less than 15 small mills is a large deposit of mill tailing. A company has been recently organized to exploit these deposits, the Golden Placer Mining, Milling and Cyanide Extraction Co., T. E. Corkhill, of Central City, secretary and manager.

Five shafts have been sunk to bedrock, showing the deposits of tailing to be from 10 to 30 ft. thick. Tests in a small mill have been made. The company owns a 100-ton mill, and proposes installing a duplicate of it, and a cyanide plant.

UTAH.

Salt Lake County.

The new Garfield smelters have begun receiving ore. The first carload of concentrate from the Utah Copper Co.'s Bingham mill, was delivered at the smelter last week. Later another lot of concentrate from the New-house-Cactus mill arrived, and this was followed by crude ore from the Boston Consolidated mine of Bingham. The bins at the new smelter will hold about 25,000 tons. By the time the first unit of the plant is ready to be blown in, about June 1, the bins will be filled.

WASHINGTON.

Ferry County.

(Special Correspondence).—The annual meeting of the stockholders of the Pearl Consolidated Mining Co. was held at Spokane, Wash., March 20, when the following board of directors was elected for the ensuing year: Charles P. Robbins, Dayton H. Stewart, Charles Theis, Leo H. Long and Frederick Burbidge. The executive officers are: C. P. Robbins, president and treasurer; D. H. Stewart, vice-president; Charles Theis, secretary. According to President Robbins' report, operations at the mine were resumed Oct. 23, 1905. When the mine was shut down the Lone Pine shaft had attained a depth of 163 ft., and had just passed through a 4-ft. vein, which assayed $3 per ton. The shaft has been sunk an additional 26 ft., the last 16 ft. being in No. 2 vein, which at this point is 7 ft. wide and assays $5.50 per ton. A station was cut at 182 ft. from the collar of the shaft and drifts run southerly 20 ft. and northerly 225 ft. on the vein, to within 45 ft. of the east side line of the Lone Pine claim. In the south drift 7 ft. of ore assays $7.65 per ton. The first 150 ft. in the north drift varies from 4½ to 10 ft. in width, assaying $4.67 per ton. From this point to the face of the drift it averages about the same width and assays $7.06 per ton, the face assaying $4.85 per ton. A raise from a point in the north drift 210 ft. from the shaft is going up to meet a winze being sunk from the tunnel level. The raise is in ore varying in width from 4 to 6 ft. and assays from $7.60 to $10.52 per ton. Surface improvements consist of a 400-ft. tramway, built to hoist wood and material from the railroad to the shaft; installation of boiler and small compressor and housing same. In January the company purchased a 35-h.p. boiler, 2-drill compressor, two Rand drills, an 8-h.p. hoist, 500 ft. of 2½-inch pipe, blacksmith outfit, fittings, etc., from the Princess Maud Gold Mining Co. for $750. This plant was put in commission on Feb. 12, and since then the cost of development work has decreased 30%. The tramway, with little addition, can be converted into a gravity tram to lower ore to the railroad, as well as to get up supplies. In December 174 5 tons of ore were stoped at a cost of $729.71, smelter receipts from same being $2,046.84. In February there were shipped from second class dump (accumulated from early workings) 310 tons, returns from the smelter being $510.71; cost to load, $86, netting $414.71. There are at the smelter 125 tons that should net $700. As soon as connection is made between the raise and winze the mine will be in condition to stope, and with a market for the ore the mine should be self-supporting.

Republic, March 30.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Yale District.

From a hole in a large ledge of quartz on the Never Slip property, four miles east of Grand Forks, rich free-gold quartz was blasted out one day last week. As a result the country around the Never Slip has been staked for miles. It is reported that the ledge is 20 ft. in width and over 1,500 ft. in length. It is owned by Simpson, Stewart, Hutton & Murphy, of Grand Forks.

Work has been started on the site for the blast furnaces and warehouse of the British Columbia Copper Co.'s new smelter at Greenwood. Tunneling has begun under the dumps, so that the slag can be removed more rapidly. W. H. Thomas, formerly of Bingham, is general manager. As the work proceeds the narrow-gauge tracks will be replaced by broad-gauge tramways, and instead of the present five-ton slag pot, a 25-ton pot will be used. The work on the new ore-bins will be rushed as fast as possible. The timbers of the old ones are being used to support the tracks over the tunnel. The water tank is being removed. Work will soon begin on the new building which will accommodate the machine and blacksmith shops. These will be fully equipped. All the mechanical appliances of the plant will be electrically driven. The three new furnaces will be much larger than the present ones. The ones now in use are 12 ft. long by 28 in. wide. The new ones will be 20 ft. long by 48 in. in width.

MEXICO.

Chihuahua.

For the past two years the Cia. Metalurgica de Torreon has been buying mining properties, and the last few months has shown an increase in activity in that direction, particularly in the Santa Barbara section of the Parral district, where they have bought several properties recently. The Torreon plant is amply supplied with good lead-fluxing ores from its various mines. Since the combination which existed for two years between the Torreon plant and the trust expired the miners have had a much better deal from the smelters, and the former concern has been gaining popularity. It has been reported for some time that the Torreon smelter is to have copper stacks put in. The reports of its recent mine purchases includes some copper properties.

Books Received.

'Electric Power Plants,' by Norman H. Schneider, is a book which will find a ready sale among those desiring a general and comprehensive knowledge of electricity and its application. It contains chapters on standard wiring; direct and alternating-current generators, motors and motor starters; testing and measuring instruments; the storage battery; the incandescent lamp, and general engineering notes; 290 pages, 203 illustrations. This book will be sent on application by the MINING AND SCIENTIFIC PRESS on receipt of the price, $1.50, in cloth: Spon & Chamberlain, publishers, 123 Liberty street, New York.

'Valve Gears for Steam Engines,' is the title of a valuable treatise on this subject (being the second edition) by Cecil H. Peabody. The object of this work is to give to engineering students instruction in the theory and practice of designing valve gears. Graphic methods are employed for this purpose, the author's idea being to give the student a thorough knowledge of the principles of valve gear construction. Common and well-known methods and processes have been used in most cases, and novelty has been rather avoided than sought. Some things, however, are original; for example, the combination of a skeleton model with construction for laying out link-motions, and other irregular or complicated gears, and several examples of double valve gears, the latter being introduced to show the scope of the methods used. This useful book will be sent on application to the MINING AND SCIENTIFIC PRESS for $2.50. John Wiley and Co., publishers, 43 East Nineteenth street, New York.

The latest treatise on cyanide is that of Robine, Lenglen and Le Clerc, under the title, 'The Cyanide Industry, Theoretically and Practically Considered,' translated from the French. It deals with the chemistry of cyanogen and its derivatives, reviewing all of the numerous compounds of cyanogen with other elements, particularly the metals, also its compounds with oxygen and sulphur. Part II is given to the present condition of the cyanide industry. Part III is devoted to the cyanide industry as applied commercially in the manufacture of cyanogen compounds. Part IV will interest those who are concerned in the cyanide process of extracting gold from its ore, as it reviews the cyanide situation throughout the world, and goes into the chemistry of the process in a painstaking manner. In an appendix is given a digest of U. S. patents relating to the cyanide process. This work will be sent by the MINING AND SCIENTIFIC PRESS upon the receipt of the price, $4. John Wiley & Sons, publishers, 43 East 19th street, New York.

Trade Treatises.

The C. W. Hunt Co., of 45 Broadway, New York, has issued Catalogue 063, 'Coal Handling Machinery,' which describes with numerous illustrations their machinery and methods of handling large amounts of coal at minimum cost.

The Compressed Air Machinery Co., of San Francisco, have issued a neat brochure descriptive of the Word Bros.' drill maker and sharpener. It is clearly and handsomely illustrated, and the operation of the machine fully described.

Personal.

ARTHUR WINSLOW is at Telluride.

AUGUST RAHT is in Salt Lake City.

BERNARD GILPIN is on his way to Mexico City.

MARTIN J. HELLER has returned to San Francisco.

GEORGE W. MAYNARD is expected in San Francisco.

CLARENCE EDSALL, of Colorado Springs, is visiting San Francisco.

EDWARD SKEWES, on his return from Mexico, is now at Minneapolis.

GELASIO CAETANI is with the Bunker Hill & Sullivan mine, at Wardner, Idaho.

J. P. EVANS, of the Colorado Iron Works, Denver, was in San Francisco this week.

CARL HENRICH is opening up a mine at Metasville, in Wilkes county, Georgia.

D. E. WOODBRIDGE has been at Clifton, Arizona, in the interest of THOS. E. COLE.

RICHARD M. JONES represents the Venture Corporation, Ltd., at Goldfield, Nevada.

A. P. KENNEDY is manager for the Hillabee Gold Mining Co., at Yates, in Alabama.

GEORGE W. MABEE, JR., formerly of Central City, Colo., is now at Tonopah, Nevada.

LEONARD D. SIVYER, of Los Angeles, is examining mines in the new gold fields of Nevada.

J. MORGAN is superintendent of the South Kalgurli mine at Kalgoorlie, Western Australia.

R. L. ROWE is on the staff of the Regina mine, on the Lake of the Woods, in Ontario, Canada.

FREDERICK GRUNDY has returned from the examination of mines in Arizona to Los Angeles.

R. H. HUGHES has been appointed chief engineer of the Dharwar Gold Mines, Ltd., in India.

J. W. STEARNS, of the Mountain Electric Co., Denver, is taking a holiday at Santa Barbara.

F. P. RODDY, secretary of the Poker Flat Gold Mine Co., Sierra county, Cal., is in San Francisco.

H. H. ARMSTEAD has returned from New York to the Silver Fissure mine at Polaris, Montana.

SARAT C. RUDRA, of Calcutta, India, is examining mines in Sierra county for New York parties.

R. S. OLIVER is now superintendent of the Addie Mining & Smelting Co. at Silver City, Idaho.

CORTLANDT E. PALMER is in Mexico, making his official visit to the Guggenheim mining properties.

J. BOYD AARONS is now superintendent of the Boulder Deep Levels mine at Kalgoorlie, Western Australia.

W. D. PINKSTON, superintendent of the Sierra Buttes mines, has returned to the mine from San Francisco.

J. W. FINNEY, superintendent of the Telegraph mine, has returned to Downieville, Cal., from San Francisco.

GEORGE MCGEE, manager of the Sovereign Gold Mine Co., has returned to his home at Fruitvale, California.

FRANK H. PROBERT, of Los Angeles, is now examining mines in the Suhuaripa district of Sonora, Mexico.

H. P. GARTHWAITE, managing director of the Butters Salvador mines, arrived from Salvador on the *Curaçao*.

W. J. LORING now resides at Melbourne, as general manager, in Australia, for Bewick, Moreing & Company.

FRED PERRYMAN has been appointed superintendent of the Sierra Alta gold mine in Sierra county, California.

ROBERT B. GLEISBERG, late manager of the Associated mines, at Kalgoorlie, is on his way from Paris to Mexico.

M. F. BURKE has returned to Boston from a visit to the mines of the Black Peak Co. at Hillsboro, New Mexico.

S. A. KNOWLES has returned to Idaho Springs, from Salt Lake, to again take charge of the Newhouse Tunnel.

H. B. MCCORMICK, superintendent of the Forest City Mining Co., has returned to the mine from San Francisco.

ARTHUR DICKINSON, of Charleton, Dickinson & Co., is in Norway, as consulting engineer to the Brustad Mines, Ltd.

A. CHESTER BEATTY, accompanied by MRS. BEATTY, sailed from New York on April 2, for a holiday tour in Italy and France.

E. L. BALLOU has left Argo, in Shasta county, to proceed to Pony, in Montana, as superintendent of the Garnet Company.

H. L. PAYNE, of The Wade & Wade Co., Los Angeles, is in Mexico examining a quicksilver property for Eastern capitalists.

A. D. LAWRY, assistant superintendent of the Combination Mines Co., at Goldfield, Nevada, was married this week at San Jose.

HERBERT M. TOD and PERCY HAGERMAN, of Colorado Springs, are investigating old tailing dumps in Amador county, California.

H. MORTIMER LAMB, editor of the *Canadian Mining Review*, has recovered from an attack of typhoid and will shortly be 'on deck' again.

THOMAS COX, late manager of the Morning mine, at Mullen, Idaho, is now in charge of the mines of the Nevada Consolidated Copper Co., at Ely, Nevada.

Latest Market Reports.

SAN FRANCISCO, April 5, 1906.

ANGLO-AMERICAN SHARES.

London, April 5, 1906.

	£	s	d		£	s	d
Camp Bird	1	4	7½	Oroville Dredging	0	18	6
El Oro	1	8	6	Stratton's Independence	0	7	9
Esperanza	4	0	0	Tomboy	1	8	0
Dolores	1	17	6				

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. April 5, 1906.)

Amalgamated	$110⅞	North Butte	$ 84
Anaconda	277¾	Old Dominion	44¾
Bingham Copper	39½	Shannon	7
Calumet & Hecla	690	Tennessee Copper	47
Daly West	14	Tonopah-Nevada	18
Granby	13	United Copper	68½
Greene Consolidated	30¾	United States	61
Nevada Con. Copper	17½	Utah Copper	29

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 60	Ophir	$6 00
Hale & Norcross	1 40	Potosi	0 29
Mexican	1 25	Savage	1 30
Exchequer	0 62	Yellow Jacket	0 16

[Tonopah and Goldfield.]

Belmont	$5 50	Montana-Tonopah	$2 95
Golden Anchor	1 17½	Ohio-Tonopah	0 46
Jim Butler	1 55	Red Top	1 82½
Jumbo	1 65	Sandstorm	1 27½
Kendall	0 95	Tonopah Ex	10 00
Midway	2 20	West End	3 50

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 64½c. per fine ounce; San Francisco, 64½c.; London, 29 1-16d. (standard ounce, 925 fine); Mexican dollars, 50@51c., San Francisco; 49¾c., New York.

COPPER.—New York (by wire, average for week ending April 5), Lake, 18.62@18.75c; Electrolytic, 18.25@18.50 Casting, 18.00@18.25c. per pound. Mill copper plates, $21; bars, 21@24c. London: £84 5s. spot per ton.

LEAD.—New York (by wire, average for week ending April 5), $5.35 per 100 lb; San Francisco, pig, 5.70@6.60c. per lb.; pipe 7¾c.; sheet, 8¾@9¾c.; London: £15 10s. ℔ long ton.

SPELTER.—New York (by wire, average for week ending April 5), $6.10@6.15 ℔ 100 lb.; London, £25 2s. 6d. ℔ ton; San Francisco, ton lots, 7c.; 100-lb lots, 7¾c.

TIN.—New York, pig, $38.00@38.50; bar tin, ℔ lb., 42¼c.; pig, 39c. London, £173 5s. 0d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, nominal, $23@25 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$41.50, large lots; London, £7 7s 6d.; San Francisco, local, $39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 35@38c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35; gray forge, $17.85; San Francisco, bar, 3½c. ℔ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.00 open hearth billets, $28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8¼c.; less than 500 lb., per lb., 8¾c.; in 25-lb. tin pails, ½c. ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ½c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8½c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 17@18c; San Francisco, 1000-lb. lots, 16c; 300@500-lbs. 12c, 100-lb. lbs. 12c; 100-lbs lots, 13c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11c; 14 oz., 9¾c; 12 oz., 8½c; 14 oz., 7¾c; Hotel, 12 oz., 9c; Granite (mining), 16 oz., 11½@11½c; 14 oz., 10@10½c; 12 oz., 9½@9½c; 10 oz., 8½c; Paraffines, White, 1s, 2s, 4s, 6s, 10½c; 12s, 11c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 9½@9¾c; 10 oz., 7¾c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6½@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

COAL.—San Francisco, coast, yard prices to dealers: Wellington, $7.50; Seattle, $6.50; Coos Bay, $5.50; Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $14.00; Cannel, $8.50; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17c; Astral, 17c; Star, 17c; Extra Star, 20c; Eocene, 19c; Elaine, 26c; Water White, in bulk, 10½c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24½c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 15½c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 65c; cs., 70c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 53c.; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 57c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—98@99% N. Y., $1.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

RED LEAD.—500 lb. and over at one purchase, ℔ lb., 8¼c.; less than 500 lb., 8½c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., 90c.

URANIUM.—Oxide, ℔ lb., $3.40.

Commercial Paragraphs.

AT the recent annual meeting of the Wellman-Seaver Morgan Co., of Cleveland, Ohio, the office of general manager, which has been vacant since the death last June of Mr. Charles H. Wellman, was filled by the election of Mr. S. H. Pitkin, whose present title will be first vice-president and general manager. Otherwise no changes were made in the officers of the company.

THE Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., report having closed a contract with the Kinloch Long Distance Telephone Co. of St. Louis, Mo., for 10,000 central energy telephones. This is the first order the Kinloch Co. placed for new telephones to be used in conjunction with the 17,000 line switchboard now being installed by the Stromberg-Carlson company.

THE Blaisdell Co., of Los Angeles, has closed a contract with the Compania Minera Las Dos Estrellas, S. A., for the equipment of its new 120-stamp mill, El Cedro, with machinery for the Blaisdell system of handling cyanide sand, for which will be required two Blaisdell excavators, four distributors, one tripper and one tailing stacker; also, an extensive system of Robins conveying belts. The Dos Estrellas plant is near the 100-stamp mill of the El Oro Mining & Railway Co., Ltd., in the cyanide plant of which the Blaisdell system has been in operation for a year, giving satisfactory results.

THE Colorado Iron Works Co. of Denver, Colo., recently entered an order for a 100-ton concentrating mill, complete erected, for the Mowry Mines Co., Patagonia, Ariz. The equipment includes Colorado Iron Works' standard rolls, impact screens, simplex tables, vanners, spitzkasten and settling cones. This company also reports the sale of impact screens to the Annie Laurie Mining Co., Kimberly, Utah; Mine La Motte Development Co., Missouri; the Bertha Mineral Co., Pulaski, Va.; the Hermosa Copper Co., Hanover, N. M.; and bullion cars to the Great Western Ore Purchasing & Reduction Co., Keeler, California.

Compressed Air announces that with its issue of May it will appear in enlarged form and under new management. Hereafter it will be published by the Kobbe Co., 90–92 West Broadway, New York. For ten years *Compressed Air* has been, and still is, the only publication devoted exclusively to compressed air in all its applications. With the May number the size of *Compressed Air* will be changed to 7 by 10, it will be printed on better paper, and in outward form will be on a par with the best printed magazines now published. Mr. W. L. Saunders, M. Am. Soc. C. E., will remain as editor-in-chief, W. R. Hulbert, M. E., will be managing editor, and P. F. Kobbe, Jr., business manager.

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TO OUR READERS

IN face of the calamity that has befallen the community in which we live, our own loss seems small. Our records, our library, the note-books of the editors, the manuscript ready for the printer, and the whole of the plant in our composing room, all lie buried under the ruins of San Francisco. But, owing to the customary precaution observed by two of us, complete copies of the weekly subscription lists had been taken to Berkeley, so that we possess that necessary record. Fortunately, most of the members of our staff live at Berkeley, where the earthquake was less severe and where no conflagration followed in the wake of this terrifying occurrence. As the earthquake occurred at 5:15 A. M., and the fire in San Francisco prevented people on this side of the Bay from reaching their offices, most of us were spared the horror of scenes that sear the memory. We are fortunate, therefore, as compared to many of our fellow citizens. And for other reasons. Our plant has been demolished; but this journal is built on nothing so ephemeral as paper, and on nothing so cheap as machinery; it is based upon the support of many thousand readers and subscribers who are never less likely to withdraw their support than at a time of misfortune. The goodwill of the Mining and Scientific Press is locked up in no safe, confined to no printing room; it cannot be shaken by an earthquake or consumed by fire. And, gentlemen, our friends, there is another something that is not destructible by physical misfortune or financial adversity, and that is the spirit that gives life to the printed word.

T. A. RICKARD,
Editor.

Berkeley, April 20, 1906.

TO OUR ADVERTISERS

OUR old offices at 330 Market Street, being in the very center of the most damaged section of San Francisco, have been totally demolished. We have lost our entire mechanical plant, including cuts, half-tones, type and the issue of April 21, which had already been set up; but fortunately, our complete and most recent mailing list has been saved.

We have secured ample offices in the First National Bank Building at Berkeley, which is on the east side of the Bay of San Francisco and close to the terminus of the trans-continental railroads. Through the courtesy of The Standard Publishing Company, we are in possession of proper facilities for printing. The Miehle presses, which will do our work, are new and of the most improved type. We will only be handicapped (for a few issues) by scarcity of paper; the rush of work at the local photo-engraving houses will prevent the use of half-tones with our reading matter, but we have arrangements pending to have this work done at Sacramento, which city was not affected by the earthquake.

We would urge all of our advertisers whose places of business have suffered, to communicate with us at the earliest moment, as our issue of April 28th will afford the best medium for advising their clients the world over of any change of address.

EDGAR RICKARD,
Business Manager.

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SAN FRANCISCO, APRIL 14, 1906.

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EDITORIAL.

ASSAYING is always with us; therefore any improvement is of importance. On another page Mr. William Magenau gives a description of one method for the assay of cyanide solutions, and he follows this with a summary of other methods suggested during recent years. Some of our readers should be able to supplement this information out of the store of their personal experience. Such practical details, dealing with daily work, are invaluable.

OUR esteemed contemporary in New York has just celebrated, in its issue of March 31, the fortieth anniversary of a useful career. We tender congratulations to *The Engineering and Mining Journal*, and, from our lofty seniority of six years, we wish it an indefinite prolongation of literary and business activity. Old associations and, more particularly, the memory of days when, under R. P. Rothwell, that periodical was the recognized organ of the mining profession, may provoke regret that it should have gone the way of trade journalism, nevertheless, on this auspicious occasion, we send greeting to our contemporary—or rather, junior—on the Atlantic seaboard.

ON the occasion of its El Paso meeting, the American Mining Congress passed a resolution emphasizing the value of water supplies in the desert and asking that the hydrographic branch of the United States Geological Survey lend its aid in the ascertainment and mapping of such sources of supply, and the procuring of information such as will safeguard the water necessary to prospectors and others who travel in the arid mineral tracts. This resolution has been acknowledged by the Director of the Survey in a courteous letter, in which he states that his department is preparing a report on the springs and other water resources of the deserts in southwestern Nevada. Other maps of the dry areas in California and Nevada are under way, and on these great care is being taken to indicate all springs, together with trails and such landmarks as are essential.

STEAM-SHOVELS have been used successfully for stripping the iron ore of the Mesabi range, Minnesota, and also in Michigan, and it is interesting to note the application of them to copper mining. At the Cactus mine, in Utah, controlled by Mr. Samuel Newhouse, the steam-shovel is turning over 300 to 400 tons per ten hours and Mr. Lafayette Hanchett, the manager, is said to find the work satisfactory. It is proposed to adopt this practice in excavating the superficial portion of the large orebodies at Ely, Nevada. At Mt. Morgan, in Queensland, the same machine is being used to handle a gold ore, as it is broken in large open-cuts on the side of a hill. Some of the best work of the kind is done at the Virginia mine of the Oliver Iron Mining Company, on the Mesabi range, where excavations are now 40 to 50 feet below the surface. There, the steam-shovel handles 3,500 tons per 10 hours, lifting three cubic yards per dipper. At the Cactus the rate of working is only three-quarters of a yard per shovelful, but as applied to copper ore the practice is, as yet, in its infancy. It is an interesting development of practice and seems applicable to deposits of disseminated copper in soft porphyry such as are found outcropping at several localities in Utah and Nevada.

IN his weekly letter, our Toronto correspondent will be found to refer to an interesting step to be taken by the Provincial Government of Ontario, it having been decided that the mineral rights on the timber tract south of Cobalt are to be exploited for the benefit of the people of the Province. Work will begin as soon as the removal of timber is effected, the date set being October 1, this year. As the tract covers 100 square miles, and at least three or four square miles of it exhibits outcrops of unusual richness, the mining operations to be undertaken by the Provincial authorities will be important. While this departure is an innovation on this continent, it is a simple method of solving a difficult problem. At one time it seemed a choice between throwing the tract open on a specified date to prospectors, with inevitable disorder and individual injustice, or of putting it up to the highest bidder, subdividing the ground into claims of reasonable size. Even this scheme would have been unfair as affording the capitalist a better chance than the prospector, and it would have required the investment of money without previous examination or testing of the mineral deposits. Both of these alternatives having been discarded, we hope the Ontario Government will be able, with the advice of the capable technical men in its employ, to exhibit model mining operations. The experiment will be watched with keen interest.

EDWARD NICHOLLS, a miner at Kalgoorlie, in Western Australia, has been awarded a medal for conspicuous gallantry. On April 18—a year ago—Nicholls with two other men, Bentley and King, was working in a stope in the Lake View Consols mine. They had charged a round of holes and lit the fuses, and were in the act of retiring for safety to the level below. Bentley had retreated only ten feet when one of the charges exploded. Nicholls was further away and partially sheltered from danger. All the lights, of course, had been put out by the explosion. Nicholls called to find out if anyone was hurt, and, hearing the groans of Bentley, he groped his way back to the top of the broken ore in the stope, a height of 40 feet. There he found Bentley, with a big stone on top of him. The other charges were due to go off within two minutes. He extricated his comrade and succeeded, at the peril of his own life, in getting him to the bottom of the stope, just before the other holes went off. This act will be appreciated by miners, who know just what chances were taken in the rescue. The British authorities have awarded Mr. Nicholls an Albert medal of the second class, and while we recognize the appropriateness of such a distinction in recognition of acts of heroism, for which gifts of money seem an improper reward, we smile at the effort, the technical reason for which is understood, to classify acts of undiluted heroism such as this. There may be deeds to which this is second class, but we doubt it. When intelligence and unselfishness are so perfectly combined in one act, there is nothing more splendid.

Block-Faulting in the Great Basin.

Fremont, the foremost explorer of the West, justly styled 'The Pathfinder,' was the first to recognize and name the Great Basin. It constitutes a vast geological province, covering all of Nevada, portions of Idaho, Utah, Southern California, Arizona and New Mexico and extending far into Mexico. The orographic features are described by Clarence King in the report on the 'Exploration of the Fortieth Parallel' and by Powell and Gilbert in the monographs of the United States Geological Survey. The Basin Range structure, prominently characteristic of that volcanic region, has been discussed at great length in its broader features; of the block-faulting incidental to its development, little has been written; indeed, the article by Mr. Walter P. Jenney, in our issue of January 27, may justly be regarded as the pioneer paper upon the subject. Block-faulting is especially interesting to the miner as preparing the way for ore deposition by furnishing channels for the ascending mineral solutions that form the so-called primary ores. The common classification of fault-displacements is one of form, based upon the direction of the throw, or upon the attitude of the fault, whether horizontal, vertical or inclined. A few types of fault-structure are classified genetically, the notable example being normal faults produced by gravity. In shear-zones the throw is distributed over a number of parallel fault-planes, which are grouped together and considered as a single fault, but with this exception, the disposition has been to treat each fault as a unit, and not to consider them collectively in groups or systems. Mr. Jenney, after discussing the conditions under which block-faulting has taken place, says that it "may be defined as a phase of igneous disturbance, giving rise to a system of faults with diverse displacement, which, according to the nature of the eruption which gave them birth, may be local, regional or zonal in its distribution."

Admitting that, in the volcanic region of the Great Basin, block-faulting is commonly associated with marked evidence of igneous action, does it invariably result either directly or indirectly, from some phase of vulcanism? In other words, cannot any abrupt dynamic action, of sufficient intensity, give rise to block-faulting? The contraction of the earth's crust due to progressive loss of internal heat, may be conceived to produce sudden fracturing and displacement in zones of structural weakness. The Basin Range structure has been compared, in the diverse positions of the displaced and up-tilted blocks, to the

piling of broken ice upon the shore. In the example mentioned, we have more or less vertical displacement of the ice-blocks, resulting from the lateral pressure upon the ice-sheets when driven by wind or current upon the beach. There is surely nothing resembling igneous action in this; then why may not the crust of the earth, moved by a vastly more powerful force, produce block-faulting in like manner by lateral pressure? Further, this form of displacement in all probability occurs occasionally in regions where, at least in the geological formations, exposed at the surface, igneous rocks are absent. In the south part of the Ozark uplift the deposits of zinc and lead ore are associated with fault-systems which in some degree resemble the zonal type of block-faulting seen in certain places in the Great Basin, for instance in the dome-shaped uplift in Ophir Cañon, in Utah, already cited by Mr. Jenney. The fault-belt in southern Illinois, extending through Kentucky, in which occur deposits of zinc ore associated with fluor-spar, is another example. Mr. George H. Ashley, at a recent meeting of the Geological Society of Washington, described the occurrence of a number of zones of displacement, of this character, in the Appalachian region from Pennsylvania to Alabama. As Mr. Jenney says: "Now that attention is drawn to it, there is reason to anticipate that block-faulting will be recognized in volcanic regions in other parts of the world." But may it not occur, at least in occasional instances in regions which are not classed as volcanic? Although we may be compelled to admit the possibility, that a molten magma forced into the depths of the crust, of which nothing appears at the surface, may have caused the upheaval? If such should prove to be the fact, the occurrence of a zone of block-faulting in sedimentary formations would imply the existence in depth of intrusive igneous masses. This is evidently the view taken by Mr. Israel C. Russell, with respect to "subtuberant mountain uplifts."

The matter is of direct interest to the mining engineer as explaining the system of displacing fractures that interrupt exploratory work underground and also as suggesting the channels along which mineralization may occur. In the Ontario and Daly-West mines there is a striking illustration of the manner in which a rich lode was formed in one case along the plane of a big fault, and in the other along a flat layer of brittle rock lying immediately under a yielding stratum, the conjunction leading to the formation of a crushed zone, affording opportunity for solution of limestone and its replacement by ore. Both the 'vein' and the 'contact' orebodies owe their origin to the conditions created by block-faulting. It is a comprehensive idea which occasionally will be found to harmonize the particular set of fractures encountered in a mine with the generalized structure of its enclosing country, explaining the part in terms of the whole.

Smelters and Their Fume.

The time has come to call a halt on the persistent blackmailing of the smelters, under the assumption that they are a public nuisance. A proverb says that one man's bread is another man's poison; certainly, the operations which insure bread to many people may entail the poisoning of an occasional cow. We frankly state our willingness to see one or two cows, a few tons of hay, or many acres of pasturage injured by smelter fume, if that fume is the outward and visible sign of a beneficent industry. There is scarcely any operation of man that some one does not consider detrimental to himself; even the unselfish activity of a missionary may spoil the trade of a wine merchant and the zeal of a railroad builder may interfere with the revenue of a steamboat company. And in this clash of conflicting interest, it has become the unwritten law to decide opposing claims by their relation to the community, the greatest good to the greatest number being the axiom of custom and legislation among civilized people. In some localities the wine merchant is considered more useful than the missionary, in others the seller of stimulants is anathema; there are communities that prefer the steamboat to the railway, choosing low freights and slow travel rather than expensive, though rapid, transport. The farmers near Benicia and the ranchmen of the Salt Lake valley may look upon metallurgy as a diabolical art, but in mining districts anxious to market ore that is unsuitable for simple treatment on the spot, the smelter is regarded as a friend in need, and we mining people have learned to consider smelting as an altogether useful process that helps us to make money from mineral deposits. It is true that a certain big group of smelter people are now synonymous with rapidly acquired wealth, and this renders them less liable to sympathy than to criticism, some of which they may merit, but we are trying to discuss the matter now in a broad way as a contest between a useful industry that has helped to build up the country and an insignificant minority in the community who attack it and hamper it, prompted by motives that are plainly not altruistic. It comes to this, shall the mining industry which has made the West and today is still the great pioneer of commerce—shall mining be handicapped because a few people find it easy to extract money from smelters under guise of damage done to their property by fume? As a matter of policy, the managers of smelting works have always been willing to pay just claims and even to buy farms or lands said to be injured by sulphurous or other smoke, but the law is complicated and its technicalities favor blackmail. The law must be obeyed, we propose no such thing as the flouting of it; but the interpretation of laws is modified by the public opinion of the time and it is our hope to help the formation of a juster conception of the relation of the smelter to the community. Shall a few cows or horses, a ranch, or a hundred acres of deforested granite—shall these suffice to hinder a useful industrial operation that contributes to the wellbeing of many thousand persons? Take an illustration: A car line is projected along a certain street, to the intense annoyance of a few householders whose sleep or country quiet is broken thereby; are their protests considered sufficient reason for the abandonment of a convenient method of transport? Of course, it is regretted that anyone should suffer and the route is chosen so as to give minimum annoyance, yet it would never occur to a town council to veto a necessary car service because Jones or Smith objects. If the street on which they live is not chosen, then Brown and Thompson, on the other street, will raise a rumpus because they suffer discomfort. Or take another case; railroads spoil the scenery of a country and disfigure the streets of a city; the proximity of noisy traffic is injurious to some of the best forms of real-estate investment; yet no one would listen to the small minority who suffered from this cause; public policy does not sanction the treatment of the railroad company as an unmitigated nuisance, nor does it encourage persistent damage suits. The community accepts the railroad as a convenience and each member of it is expected to put up with his share of annoyance or damage in order that the community as a whole may profit by better facilities of communication. The individual must give way to the general good. So also with a smelter; the site is usually chosen remote from the homes of the people and always to leeward of the prevailing winds. Occasionally this cannot be done; sometimes the smelter is in the town itself, as were the first works built at Leadville and Omaha; sometimes the site is outside the city, but the latter grows until the smelter is well within the settlement, as has happened to the Argo and the Grant smelters, at Denver; more rarely, a town is frankly given up to mining, so that the hurt to vegetation is not considered at all and the rising smelter smoke is regarded as a sign of prosperity; as was formerly the case at Butte City. For mining communities that have been built up by the aid of smelting and for towns that were made by their reduction works, and that now try to hold up these metallurgical establishments, we have no sympathy whatever. Many years ago some of the people of Swansea, in Wales, importuned Parliament to put a restraining hand on the chemical and smelting works whose sulphurous fume was destroying the vegetation, and they received the retort that they were killing the very industry that made them: What would Swansea have been save for her smelters? So, too, in regard to Butte City, Salt Lake City, Denver and even San Francisco, we ask: What would these cities have been save for the mining industry which built them up, and sustained them until, in some instances, there gathered a population that could buy the produce of the farm and field? The mine and the smelter created the market for their produce.

By the Way.

Writing for the *Athenæum* on helium and the transmutation of elements, Prof. William Ramsay says that the story of helium is perhaps the most romantic in the history of science, and a story of which the last chapters are still unwritten. Originally seen as a spectrum line in the chromosphere of the sun, it was discovered on the earth, 28 years later; and has provided the first authentic case of transmutation—a problem which occupied the alchemists from the sixth century. Prof. Ramsay tells of the discovery in 1868 of the spectrum of helium, and then continues:

"Shortly after the discovery of argon in 1884, the notice of one of the discoverers was drawn to an account by Dr. Hillebrand, of the United States Geological Survey, of the presence in certain ores containing uranium of a gas which could be extracted by an air-pump. Hillebrand examined the spectrum of the gas, and supposed it to be nitrogen. It is true that he saw in it spectrum lines which could hardly be ascribed to nitrogen; but on mentioning the fact to his colleagues, he was bantered out of his quest, and did not follow up the clue. Now in the spring of 1895 attempts were being made to cause argon to combine; and it was argued that conceivably Hillebrand's gas might turn out to be argon, and might give an indication to a possible compound. Consequently, a specimen of clevite—one of the minerals which Hillebrand had found to give off the supposed nitrogen in largest quantity—was purchased, and the gas was collected from it. On purification its spectrum showed the presence of a brilliant yellow line, almost identical in position with the yellow lines of sodium. It was soon evident that the solar gas, helium, had been discovered on the earth.

"The minerals which contain helium have one thing in common; they all contain uranium or thorium, or lead, or a mixture of these. Minerals of lead alone do not show the presence of helium; but it may be stated that helium is an invariable constituent of ores of uranium and thorium. It was at first supposed that such minerals contain helium in a state of combination; but this view could not be substantiated, for the constituents of these ores do not show any tendency toward combination with helium. The connection of this with what follows is very remarkable.

"The explanation of the fact that compounds of radium discovered by Madame Curie in 1901 are permanently at a temperature considerably above that of the atmosphere and that they are continually emitting corpuscles of high velocity, was given by Prof. Rutherford and Mr. Frederick Soddy in a series of papers communicated to the *Philosophical Magazine*. It is that radium and allied bodies are 'disintegrating'—that their atoms are spontaneously flying to bits. Now this view, although new in its application to elements, has long been known to hold for certain compounds. There is a fearfully explosive compound of nitrogen with chlorine which on the least touch resolves itself suddenly into its constituent elements. It is true that here we have a molecule composed of atoms disintegrating into atoms which subsequently combine to form new molecules of nitrogen and of chlorine; but in principle an analogy may be drawn between the disruption of the molecules of an explosive compound and the disintegration of an atom into corpuscles. Prof. Rutherford and Mr. Soddy showed, however, that corpuscles which have been proved by Prof. J. J. Thomson of Cambridge to be exceedingly minute are not the only products of disintegration of the radium atom; the proof was adduced that among these products were atoms of a density comparable with that of hydrogen and helium. This hypothesis evidently admitted of experimental proof, and in conjunction with Mr. Soddy I collected the 'emanation' or gas evolved from salts of radium. We showed that this gas, presumably of high density, disintegrates in its turn, and that perhaps seven per cent of it changes into helium. What becomes of the remaining 93% is as yet undecided; still some hint may be gained from the fact that a constant ratio exists between the amount of helium obtainable from a mineral and the weight of lead which it contains. It may be that lead forms the ultimate product, or, at least, one of the ultimate products of the disintegration of the atom of emanation. Another radio-active element, actinium, has been shown by its discoverer, Debierne, also to yield helium by the disintegration of the emanation, or gas, which it continuously evolves. This disruptive change is attended by a great evolution of heat; for the radio-active elements are in a sense explosive; and explosions are always accompanied by a rise of temperature. But such atomic explosions surpass in degree, to an almost inconceivable extent, the molecular explosions with which we are familiar. Could we induce a fragment of radium to evolve all its energy at once, the result would be terrific, for in the energy with which it parts during its change it surpasses in explosive power our most potent gun cotton by millions of times. It has been suggested that to this or similar changes are due the continued high temperature of the sun and the presence of helium in its chromosphere."

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and to give information dealing with the practice of mining, milling and smelting.

SOME assayers prefer to use tacks rather than nails in making assays of sulphides.

THE melting point of tin is 446° F. That of gold 2,097° and of platinum 3,227°.

LITTLE mica is produced on the Pacific Coast and the market for the mineral is limited.

ORDINARILY 100 tons of waste broken in the mine will fill the space previously occupied by 150 tons of ore.

A JAW ROCK-BREAKER, 10 by 16 in., requires about 15 h.p. more or less, depending on the hardness of the ore.

MEXICO produces a variety of rare combinations of silver, copper and lead—minerals almost unknown elsewhere.

DYNAMITE is the name applied to all kinds of nitroglycerine blasting material when mixed with an absorbent.

THE addition of barium peroxide to a cyanide solution will materially hasten the dissolving of gold placed in solution.

AN explosive compound may be made by immersing ter-chloride of gold in caustic ammonia. It is an unstable and dangerous compound.

THERE are large areas of serpentine in California and asbestos occurs in many places in it, but rarely in large amount or of commercial value.

THE sulphide of tin occurs in nature as the mineral stannite, but is comparatively rare. It also is found combined with copper, sulphur and arsenic.

WINDING at some of the deep shafts on Lake Superior, at Butte and in California is at the rate of 3,000 to 5,000 ft. per minute, when at maximum speed.

SULPHURIC ACID may be concentrated by boiling, and so long as the temperature does not rise above 300° F. little or no sulphurous fumes pass off into the atmosphere.

ELBOWS, sharp bends and other irregularities in pipe-lines increase the friction of the currents of air or water passing along the line, and should be avoided as far as possible.

IF a solution is saturated while warm and then allowed to cool, frequently the mineral in solution will crystallize. This fact is often taken advantage of to obtain crystals of various substances.

THERE are now recognized 75 elementary substances. The lowest atomic weight is that of hydrogen, 1.008; the highest uranium, 238.5. That of gold is 197.2, and of platinum 194.8. Radium is placed at 225.

OLD nitro powder is extremely dangerous. It may not be as effective a blasting agent as new powder, but it still possesses terrific explosive force and should be handled with as much caution as new powder.

HIGH-GRADE POWDERS generally shatter the rocks in small fragments, the lower grades breaking the rocks larger. Accordingly the miner and quarryman chooses the powder best suited to his requirements.

METHANE is a simple compound of hydrogen and carbon, and next to hydrogen is the lightest gas known. It is highly inflammable, and is known also as marsh gas, from its occurrence in marshes, due to the decomposition of organic matter.

MINERAL COLLECTIONS are of little value unless properly classified. Museums containing many thousands of specimens must necessarily have many duplicates from various localities, as there are only a few hundred species recognized.

CHARCOAL will precipitate gold from chlorine and cyanide solutions. It has been extensively used for this purpose in the chlorination process as practiced at Mount Morgan, Queensland, Australia, but is almost unknown in practice elsewhere.

GOLD is sometimes found in placer sluices, coated with mercury, and is mistaken for platinum. Heating the gold will cause the mercury to be volatilized, leaving the gold bright yellow. The mercury can also be removed by placing the metal in nitric acid.

A CROSSHEAD for use in a shaft to prevent swinging of the buckets, should be at least twice as high as it is wide to lessen as far as possible any tendency of the crosshead to jam in the shaft, something that not infrequently happens when the crosshead is short.

ONE of the deepest soundings thus far recorded is that made by H. M. S. *Penguin*, which reported a depth of 4,762 fathoms—more than five miles. This sounding was taken between Auckland and the Tonga archipelago (Society Islands), in the South Pacific Ocean.

A SHORT CIRCUIT is the term used in electricity to indicate that a connection between a positive and negative wire has accidentally been made, enabling the current to take a short cut, instead of completing the current through the wires, and lamp or motor.

WHEN asking questions of 'Concentrates,' state the proposition clearly in order that the question may receive an intelligible answer. Often questions are asked in which insufficient data are given, and this renders the matter of suitable reply either difficult or impossible.

WHEN saltpeter is strongly heated it gives off a gas. When the evolution of the gas ceases a crystalline substance remains which, upon treatment with sulphuric acid, yields red fumes, something which saltpeter will not do. Saltpeter can be further decomposed by heating.

FOR many centuries water was regarded as an element, until in 1781, Cavendish discovered that when a mixture of hydrogen and oxygen exploded water was formed. Later it was realized that water was composed of two elements — hydrogen two parts and oxygen one part.

MEN shoveling in a close drift are not infrequently given the racking, nauseating headache, known as powder-head, hours after blasting, from the fumes of nitrous oxide imprisoned in the wet muck, which is released into the air of the drift by the shoveling of the workmen.

THE mine owner must so operate his property that no damage is done to his neighbors. He may do things in what he may consider a workmanlike manner, and still damage may result, for which he is responsible. His contention that he worked in a workmanlike manner constitutes no defense.

OXYGEN is apparently essential to the dissolution of gold in cyanide solutions. It is said that if gold leaf be dropped into a solution of potassium cyanide contained in a bottle, and tightly corked, the cyanide will have little or no effect on the gold, but if the cork be removed the gold will soon disappear.

THE richest copper ore is cuprite, which, when pure, contains 88.8% metallic copper. There is no chalcocite (copper glance) containing 82% copper, for this mineral, when pure, contains only 79.8% copper, and 20.2% sulphur. It is not uncommon to find the metallic content of high-grade ore overstated.

A MILL-RUN would have little value unless careful checks were made on all that takes place during the run. Among these things are: Amount of ore treated during the run; amount of gold and silver saved by amalgamation; percentage of concentrate saved; value of concentrate per ton; assay of tailing, and subsequent extraction of cyanide.

ANY citizen of the United States (including women and minors) may legally locate a mining claim on the unoccupied lands of the United States, provided a *bona fide* discovery can be made. A person, an employee of a company, having no fiduciary or confidential relations of trust with a company, may locate a claim for himself or for others in the hours when he is not on duty.

IF the crosscut passed through the vein and encountered a dike, and a drift on the vein soon ran out of ore, it may be possible that the vein was intersected by the dike. The crosscut should be continued through the dike and a drift run on the opposite side to ascertain whether the theory advanced is correct. The description of conditions warrants a belief in the opinion above given.

PAYSTREAK, in the parlance of the placer miner, means that portion of the channel or deposit containing the highest values, even though the poorest portion be payable. To the vein miner it represents the best portion of the vein. In many veins there is a streak at one side or the other, or in the center of the vein, carrying high-grade ore—the paystreak—whether the balance of the vein can be profitably handled or not.

ROCKS are mineral aggregates. They are either simple, as calcite (calcium carbonate), siderite (iron carbonate), or gypsum (calcium sulphate); or composite, as diorite, diabase, granite, etc., each of which is made up of several separate minerals. The names applied to rocks usually indicate their character, as quartz-mica-diorite, which means a diorite in which quartz and mica occur, neither of which are essential to diorite.

EPIDOTE is a mineral of peculiar yellowish-green color, the result of alteration usually of hornblende or augite. The augite alters to the variety of hornblende known as uralite, and this or original hornblende is changed to chlorite and the latter by further alteration to epidote. It is a common constituent of metamorphic rocks containing hornblende, and also in diorite and granite. Its presence has no valuable significance.

DIABASE has so frequently been found associated with gold-bearing veins that many have come to look upon that rock as a safe indication of a valuable gold mine. This is a fallacy, for diabase is found in scores of places where no gold is known. Andesite and granite are as much entitled to be considered as indicative of profitable gold mines as diabase, if not more so; but andesite and granite, like diabase, occur over hundreds of miles of territory with no sign of gold.

THE 'law of multiple proportions' is to the effect that when two elements combine to form more than one compound, the different weights of the one element which unite with one and the same weight of the other element bear a simple ratio to each other. The absolute weight of atoms is not known. They are so small that no one has ever undertaken or, at least, succeeded in determining either the size or weight of atoms, or of molecules, except approximately.

ARSENICAL SULPHIDES are not always rich in gold, though in regions of gold ores the mispickel is usually gold-bearing, as galena is usually argentiferous, though in some regions the amount of silver present is very small, as in the lead-zinc ores of Missouri. In California arsenical sulphides are frequently found associated with pockets of gold, and therefore the appearance of mispickel has come to be considered as an indication of the proximity of a gold pocket in some mines.

IT would be a difficult matter to pre-determine the life of a steel cable on a gravity tram without knowing anything about the conditions under which the rope would work. The length and grade of the tramway are important factors; also the presence or absence of idlers to carry the rope. Curves are also important if there are any. A good rope, if kept in good condition by the use of rope grease, should last as long as a similar rope in an inclined shaft of the same degree of inclination underground.

THERE are few lead minerals having a large commercial value, owing to their comparative scarcity. The principal sources of the lead of commerce are galena and carbonate of lead. The lead minerals, however, form many of the most beautiful specimens and are highly prized by collectors of minerals. Among the most attractive of the lead ores are: wulfenite (honey yellow), vanadinite (orange red), cerussite (the white crystallized variety), anglesite, pyromorphite, and linarite, the latter a beautiful blue mineral, being a sulphate of lead and copper.

HYDROGEN is produced from several of its various compounds; water is decomposed by the electric current, and hydrogen is set free; palladium-hydrogen is broken up by heat and hydrogen and palladium freed. The ordinary methods of obtaining hydrogen are some of the following: The action of dilute sulphuric acid on zinc; the action of zinc or aluminum filings on caustic potash or slaked lime; the action of sodium or potassium on water or alcohol; magnesium powder, when boiled with water, evolves hydrogen, particularly when some magnesium chloride is dissolved in the water, for the reason that such a solution dissolves the magnesium oxide which forms on the surface of the metal. Red-hot iron immersed in water causes a decomposition of a portion of the water with the liberation of hydrogen.

ONE method of making copper sulphate is the following: Copper is immersed in sulphuric acid, 66° B., and the acid heated. The acid is partly decomposed; the copper is transformed, first to sulphide and then to oxide, sulphurous acid and steam being liberated. The undecomposed sulphuric acid unites with the oxide of copper and transforms it into sulphate. By continuing the heating operation, the excess of sulphuric acid, if any, volatilizes, and anhydrous sulphate, mixed with a small quantity of sulphide of copper, remains. On again treating the mass with hot water, the sulphate dissolves; the liquor is decanted and crystallizes on cooling. The copper remaining still unattacked, if any such exists, is collected and again enters the cycle of operations. The copper is introduced metallic, either granulated, precipitated or as sheets or wire.

SULPHIDES are usually sampled in the sacking room, by taking a quantity from the sacked concentrate by means of a half-round instrument of Russia iron similar to a butter-tryer. The tryer can be pushed down into the sulphides as far as desired, and they usually contain sufficient moisture to enable the assayer to obtain an average sample of the contents of the sack. Samples may be taken in the same manner from the pile of sulphides on the floor, or from the vanner boxes, if not too wet. The samples thus taken may be dried and assayed separately, or they may be mixed and an average taken, which should give results approximating those obtained by a mechanical sampling works, from the same material, if the sample is taken in proper amount from each place. It would be manifestly improper to take a two-ounce sample from a sack containing 120 lb. of concentrate and to take the same amount from a sack containing only 80 lb. If the sulphide is fairly even in value no great discrepancy will result; but if one be much higher grade than the other, the mixing of samples will not give correct results. At the reduction works the sulphurets received for treatment are usually sampled automatically by machinery, which will give as accurate results as can be obtained by hand manipulation.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

HANDLING MEN.

The Editor:

Sir—I was very much interested in the article written by R. B. Nickerson, which appeared in your issue of March 3, headed 'Handling Men Underground,' and while I am willing to admit that the article is well written and shows the result of some observation of men and things, yet it strikes me as being somewhat over-drawn, in that the type of foreman first described would seem to be entirely destitute of all vestige of humanity, while the second is almost too much of a good fellow.

In my experience of more than sixteen years, in and around mines, acting in every capacity from mucker to superintendent, I have come in contact with a great variety of mine-foremen, some of them in many respects resembling the type first described by Mr. Nickerson and others who approximated the second, but I have, as yet, failed to see men of either type who were eminently successful, in every sense of the word, in the knotty problem of handling men.

The first type is, if I may be allowed the term, a 'bull-dozer' and is only fit to drive cattle, and indeed hardly that. A man (save the mark) who is so utterly devoid of all sense of right and justice as to be continually harassing the men under him, sneaking in on them at all unlikely moments, trusting no one and refusing to be satisfied when his men have done a good shift's work, is the kind of creature who kicks at the head of the man below him in position and cravenly licks the heels of the person above. He is the most contemptible creature on the face of the earth and, it seems to me, no one, whether miner or superintendent, could have a particle of respect for such a cur. I have in mind at this time a fellow who was given a little brief authority in the Black Hills in the year 1890. He did not shine as a miner to any great extent and whenever the chance presented itself would 'throw off' and was an adept at extinguishing his light and "watching the boss" from the shady side of a post or other coign of vantage. For some inscrutable reason (probably on the theory that it takes a thief to catch a thief), he was elevated to the dignified position of shift-boss in the Homestake mine. With this unlooked-for dignity thrust upon him, he commenced tyrannizing the men under him, many of whom were his superiors in every way, and acting out the part of Mr. Nickerson's party of the first part very closely indeed. He managed to hold this position for 8 or 10 months and was then relegated to the hammer again, his superior officer evidently recognizing the fact that the actions of such an intolerant, inconsistent ignoramus did not make for 'results' in the long run.

Now for Mr. Nickerson's other character. A man who has acquired a reputation among his employees as 'a good man to work for' and 'a fine fellow' etc. without qualification, may generally be regarded with some suspicion by his superintendent and it is likely to be found before long that "there is a nigger in the woodpile" somewhere. A man in charge of the underground work of a mine has all kinds and characters of men to deal with and he will be compelled to treat every one according as he finds him. He will find it impossible, as long as he is human, and only human, himself, to be "quiet, genial, courteous, and pleasant in all his dealings with his men"—to quote Mr. Nickerson—because he will be sure to get his share of that shiftless, careless 'ten-day' brand who will tax the spirit of a saint. He may be situated in some remote place, where the kind of workmen he would naturally select are not available and he will, therefore, be compelled to handle many who are incompetent and, in many ways, undesirable. Then, too, no man's judgment is infallible in sizing up another man's worth at first sight and he will, therefore, find those undesirable, shirking ones creeping in among his force and, if that force be a large one, it takes some little time to weed them out and get others in their places. If he tries, as Mr. Nickerson says, to make a good workman out of inferior material, this proceeding will take time also and, in many cases, will result in disappointment.

It has been said, and perhaps with some degree of justification, that the mine-foreman is situated between the devil and the deep sea. On one side, the management is looking for and demanding results, and on the other a disgruntled, incompetent, careless, shirking crew is by all means to be avoided. The man most likely to fill this gap and handle these conditions successfully is he who represents the happy mean between the 'bull-dozer' and the 'good fellow.' He must be able to judge human nature as well as possible; he must be competent to pass on a man's merits as a worker and know whether or not he is doing a day's work, without sneaking in on him; he must have a reasonable disposition, not railing at a man and finding fault with him and his work without just cause for doing so. There is nothing that will make a man so sore as to be brow-beaten and found fault with when he has conscientiously done his best.

I am firmly of the opinion that hard and fast lines cannot govern the personal relations between a foreman and his men. Different men require different treatment; there are those who, if bull-dozed, will pretend to take it and swallow it and then seize every opportunity to "get the best of the pusher;" in another case, such a proceeding would simply precipitate a quarrel or, possibly, a ridiculous scrap. Then there is the suave, smart kind who has the habit of saying Yes and No just as the boss appears to wish, and who gets the idea sometimes that he is "all solid." This brand must be given to understand that they must get in and drill, or it will be all off with them in a hurry.

As to a foreman conferring with his men: There are lots of men with whom a foreman can confer to good advantage indeed, while there are many others from whom it would be simply ridiculous to ask an opinion. In regard to married men: All other things being equal, a married man is to be preferred to the single for the reason that, as a rule, he cannot afford to be arrogant or shirk his duty or engage in needless discussions and criticisms; having the responsibility of a family he is more disposed to be reasonable and to do the right thing by his employer than the irresponsible single man whose home is the bunk-house and whose entire belongings can be rolled up in his blankets at a minute's notice, to hit the trail for "greener fields far away." This, however, on the premise, stated above, that all other things are equal. I have had single men work for me month after month, doing good work and giving entire satisfaction; they have ultimately left and I knew I had lost good men; I have had married men on my force who, to judge by their actions, seemed to think they had a right to be cared for and kept on simply because they were married.

As I intimated before, the mine-foreman's lot is not an entirely enviable one; his business is exacting; his experiences manifold; he is compelled to govern his actions in accordance with circumstances and he will find that, do what he may, his actions will be continually criticised by his employees, but the nearer he comes to the standard of treating his men right, demanding full day's work and giving credit for the same, asserting his will when he knows he is right, and refusing to bully on the one hand or toadying or being toadied to on the other, the nearer, in my humble opinion, he will come to being successful in all that the term implies, for in this, as in every other walk of life, success can never be attained at the expense of character, integrity and manhood.

EDWARD W. RALPH.

Seattle, Washington, March 9, 1906.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—This is rather a large subject to be adequately treated in the limited space which you can allot to such discussion, and the statement of individual views and opinions in your paper. The best shape for a shaft depends very largely on—and ought to be determined for—the special conditions of each case. I shall, therefore, in my remarks, mainly follow the conditions of the case mentioned in Mr. Burrows' statement.

In deciding on the shape, or horizontal section, of a shaft, we ought to take into account:

1. The amount of rock and water which it is intended to hoist regularly through the shaft from a stated maximum depth, allowing for a possible large excess of water over and above the anticipated amount.

2. The facilitating, and thereby expediting, of sinking, that is, the influence of any particular shape on blasting, and on hoisting the broken rock, 'mucking,' and last, but by no means least, for taking care of any unexpected quantities of water which may be encountered in deepening the opening at any time.

In other words, in deciding on any particular shape for the shaft, it will be advisable to consider, in the first place, what I may call the ultimate maximum duty, which the shaft may be called on to perform in the way of hoisting rock, water, men, tools, etc., and in the second place, if two different shapes would serve this purpose equally well, or approximately so, to give that shape the preference, that will give the best facilities for the work of sinking. And in this last consideration it is the facility and convenience of handling the water, which is of far greater importance than the possible saving of 15 or 20% of 'mucking.' Any blast may bring a sudden and unexpected influx of water.

To come to the case under consideration: The old Mexican shaft 320 ft. deep, with a square section of 10 by 10 ft. This shaft is to be sunk for the present 2,300 ft. deep, with the probability of it ultimately reaching a depth of 4,000 to 4,500 ft. This last feature of the case is not stated by Mr. Burrows, but it was one of the reasons why the possible enlargement of the 10 by 10-ft. shaft to a 10 by 16-ft. shaft was taken into consideration, if it ever should become necessary to have greater hoisting capacity than the 10 by 10-ft. shaft would afford. We may, therefore, leave the 10 by 16-ft. shaft out of our discussion and confine ourselves to a comparison of the 10 by 10-ft. square shaft with the 5 by 16-ft. oblong shaft, with and without the 'jog' at 300 feet.

It seems to me that the question whether the 10 by 10-ft. shaft with its nominal 100 sq. ft. will require 25% more mucking than the 5 by 16-ft. shaft with its nominal 80 sq. ft. area, and will, therefore, be slower in sinking, cannot be affirmed. The 10 by 10-ft. section will allow deeper drill-holes, heavier charges, and thereby require a smaller number of removals, and re-installment of drills and pumps. There will be less shattering of the sides of the shaft by blasting in a length of 10 ft. than in 16 ft. How much this difference in favor of the 10 by 10-ft. shaft will amount to, depends altogether on the nature of the rock and the skill of the mine foreman; it cannot be foretold. My opinion is that even in such firm, well-standing rock as will probably be encountered in the Guanajuato shaft, not over 15% additional 'mucking' will have to be charged against the 10 by 10-ft. as compared with the 5 by 16-ft. shaft.

The alleged inconvenience of timbering a 10 by 10-ft. shaft as compared with a 5 by 16-ft. shaft, need hardly be considered seriously. The increase in the size of one of the timbers for the 10 by 10-ft. shaft and the thereby increased cost amounts, when figured out, to such a small matter that it will be probably more than balanced by the decrease in the cost of putting in three vertical rows of timbers, two ends and a divider, as against four vertical sets, two ends and two dividers. At any rate the difference in the cost of timbering the two shafts will be too small to be a factor in the choice.

The main reason for Mr. Burrows' (and many other good engineers') choice of the oblong three-compartment 5 by 16-ft. shaft, has evidently been the compelling force of custom. It is done that way anywhere, "In South Africa, California, and other mining regions," and therefore it must be the best way to do it in this case. Follow in the old rut. It is eminently safe. Unfortunately for the case in hand, a jog in a shaft, 320 ft. below its collar, is not customary; and that circumstance set some of the directors to thinking, whether an oblong 5 by 16, or 6 by 16-ft. shaft was in reality preferable to a 10 by 10-ft. shaft, and if so, whether the advantages of a 6 by 16-ft. shaft over a 10 by 10-ft. shaft were sufficient to justify changing the size and shape of the shaft, already sunk as a 10 by 10-ft. shaft to a depth of over 300 feet.

By changing the 10 by 10-ft. shaft, at 320 ft, to a 5 by 16-ft. shaft, we evidently are able to use only a 5 by 10-ft. space for hoisting purposes. All hoisting, whether rock-buckets or water-tanks, pumps, pipes, men, tools, timber, etc., will have to be done through the two compartments in the 5 by 10-ft. space. We may install a sinking, or permanent pump, in the 5 by 6-ft. space underneath the jog; but to lower the pump after blasting, and to hoist it out of the way of blasts, we will have to swing it into one of the 5 by 6-ft. spaces underneath the jog. That a sinking pump can be much easier and more quickly handled by an extra hoist and separate cable in the 10 by 10-ft. shaft, is too obvious an advantage and too self-evident, to need any further elucidation.

There is at least as much hoisting area for rock in the 10 by 10 as in the 5 by 16-ft. shaft. Beside, there will be in the 10 by 10-ft. shaft an additional hoisting area of 4½ by 10 ft., which by means of a separate hoist may be utilized for hoisting-pumps, water-tanks, tools, timbers, etc., without interference with the hoisting of broken rock. The square shape of the shaft, with the long 4½ by 10-ft. compartment behind the twisting compartments, makes for greater accessibility of any compartment for repairs and in case of accident. If two hoisting compartments put into the 5 by 10-ft. hoisting area of the 5 by 16-ft. shaft, are sufficient to hoist 1,000 tons from 4,000 ft. depth, the same area is available in the 10 by 10-ft. shaft, and more, if necessary. We might make the hoisting-area for rock 6 by 10 ft. and still have plenty of room for pump-compartment, ladder-way and timber-skip. If it was not for the jog at 320 ft., we should have, in the 5 by 16-ft. shaft, a 5 by 5-ft. compartment coming to the surface through which hoisting might be done, but hardly with convenience or safety, if this 5 by 5-ft. compartment were also to accommodate water and air-pipes, electric wiring, beside a possibly necessary ladder-way. The 4½ by 10-ft. space of the 10 by 10-ft. shaft will allow putting all this at one end, leaving plenty of room for hoisting at the other end. The advantage in sinking of having 10 by 10-ft. hoisting space, as against 5 by 10, and thus being able to use double the number of buckets or water-tanks, by simply installing an additional small hoisting-engine, is so obvious—I need not further enlarge on it.

There remains, in favor of the oblong usual three-compartment shaft only the sanction of old custom. Without any special justification, this custom has gradually established itself by the growth of the original one-compartment shaft to a two-compartment shaft, in which one cage balanced the other, the drums being placed on the same shaft of the winding-engine. When later a third, fourth, fifth or sixth compartment became desirable, it was only natural to lengthen the shaft. The shape of the shaft was adapted more to the type of winding-engine used and to the convenient position of these engines; more so, at any rate, than the construction and position of this machinery to the best possible shape of the shaft.

As stated in the beginning of this communication, the best possible shape, or horizontal section, for any

shaft ought to be determined by all the conditions surrounding each individual case. It may be the present, usual, oblong, rectangular shape. It may be a square shaft, as in the case under review. It may be a round or an elliptical shaft. It may even be an octagonal shaft like the celebrated Valenciana and Rayas shafts at Guanajuato. It all depends on the conditions of each special case. The hoisting machinery can be constructed, and certainly can be placed to suit the requirements of any possible best shaft-section. The shape, especially of a costly deep shaft, should certainly not be made dependent on any preconceived notion of placing the hoisting machinery.

CARL HENRICH.

Metasville, Georgia, March 22, 1906.

THE BEST SHAPE FOR A SHAFT.

The Editor:

Sir—There can be little advantage to the profession at large if the discussion as to the best shape for a shaft is to be fixed by the conditions advanced by Mr. Burrows, wherein he describes a particular shaft of unusual proportions that is already partly constructed, and which so far fulfils the requirements of the occasion that the management has decided to avail itself of the old opening for the development and operation of the property. In its application to this particular shaft, the discussion should bear more generally upon the best shape for *all* vertical shafts, whether the same be circular, elliptical, polygonal single or double-width rectangular-cross-sectional areas. If the various conditions under which the different shapes are best suited to a particular class of work can be established by such a discussion, much good will be done, while if those which affect the shaft itself during its construction and the causes which make one shape the best at one point or mine and another shape or construction more suitable at some other point are clearly pointed out, the profession will also be the gainer.

Circular shafts are but little employed in America, but they are much used in Europe, and in the Witwatersrand goldfields of South Africa; on the Rand one of 11-ft. diam. in the clear has been sunk at the New Primrose mine and one 15-ft. diam. at the Langlaagate Royal. Such shafts are constructed of stone, brick or cement walling, of metal cast to required shapes in the form of tubbing, or by assembling together segments formed of structural shapes bent to required curves to form the supporting structure. Such shafts are particularly well adapted to firm ground, but they may be employed advantageously under all conditions, except where the structure is subjected to unequal and uneven pressure or where there is a creep of a portion of the enclosing rock-masses with reference to other portions thereof. On account of their shape, much space is rendered unavailable to the uses of the mine, except so far as such unused space is advantageous to the ventilation of workings. The compartments are separated from each other by dividers built into the walls or attached thereto, to which are affixed the guides upon which run the skips or cages and from which are hung the water-columns, air and steam-pipes, and ladders.

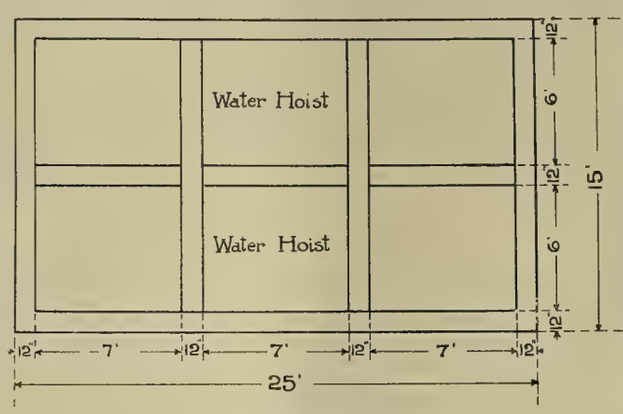
Elliptical shafts are sometimes employed in preference to the circular shaft, the advantages being that there is less waste space in one of such shape; and if they are properly placed with reference to unequal pressure from the walls, such a construction is considered to be superior in strength to the circular form. Other considerations apply equally to both forms.

Polygonal shafts are sometimes, though rarely, employed at the present time. At Guanajuato, in Mexico, where is situated the shaft described by Mr. Burrows, the hexagonal shaft of Nuestra Señora de Guadalupe has long been sunk, the octagonal main shaft of the Mellado, 40 ft. inside diam., had reached the depth of 1,260 ft. early in the last century, while the great octagonal shaft, El Tiro General, of the Valenciana mine, 36 ft. inside diam., had reached a depth of 1,700 ft. prior to 1820. The reason for this use of the octagonal shaft lies in the fact that eight separate whims, each operated by from 12 to 16 horses in shifts of three hours, were simultaneously employed upon the shaft in connection with the work of hoisting to surface the water and material extracted from the interior workings of the mine. The wall-rocks of these shafts were such that no artificial structure was required for their support; but under conditions where the enclosing ground must be held in position through artificial means, it is certain that the circular or rectangular form would in every way be stronger and better than could any possible polygonal construction.

Rectangular shafts are more generally applied to the various operations connected with underground mining than are other shapes, and probably for the reason that (except under abnormal conditions to overcome which the circular shaft is sometimes peculiarly adapted) the rectangular form can be so much more easily constructed and repaired and the parts of the supporting structure placed in position, aligned and fixed in place, and removed and replaced with comparatively little difficulty. Furthermore, when the rectangular shaft is designed with reference to the operations that are to be carried on through it, there is little waste space, the working is compact and all parts thereof are accessible and handily placed for the work in view and for inspection or repair.

Rectangular shafts are of three kinds — the L shaft, the single-width shaft and the double-width shaft. Under ordinary conditions the L shaft should never be employed, for its shape is such that it must necessarily increase the expense of breaking ground to the required form; where the enclosing rock possesses a tendency to swell or where movement is likely to occur, a twisting movement is set up within the frame and causes unequal pressure upon the parts. It is a question if it would not be more satisfactory and more economical to extend the shaft mentioned by Mr. Burrows as a double-width four-compartment shaft to the deep rather than attempt to eliminate waste space existing in the four compartments by the construction of a three-compartment L shaft within the limits of the original shaft.

The modern practice of balancing loads upon the hoisting engine makes for economy in operation, and therefore rectangular shafts are usually constructed with two hoisting compartments under conditions which warrant so large a shaft. A third compartment, therefore, is necessary for the accommodation of contrivances connected with the drainage, ventilation and power-appliances needful in underground mining, together with the handling of timber and other supplies. This compartment is therefore added to the shaft, at the side of the two hoisting compartments, making a three-compartment single-width shaft, and it is this reason probably which has brought the single-width construction into such general use. Another reason favoring its employment is that the single-width shaft lends itself more readily to enlargement at any and all times than does any other shape, while in the larger four, five and six-compartment shafts the construction is such that the supporting structure may be repaired and the parts thereof replaced in units without a complete cessation of operation, certain of the compartments being closed for repairs, while others are available for work.



Plan of Red Jacket Shaft.

Where large quantities of material are hoisted through a shaft, so that it becomes economy to give up two hoisting-compartments entirely to such use, and where considerable quantities of timber and other supplies are lowered into the mine, one or more compartments are added to the three-compartment shaft, either in line with the single-width compartments, or two and two, or three and three, the compartments are doubled to form the double-width four or six-compartment shaft. In ground of good characteristics for strength and coherence, or under conditions where the supporting structure of the working will not be subjected to abnormal pressures resulting from swelling ground, it is probable that the double-width shaft is to be preferred for extensive underground operations. There is no question but that in the double-width shaft the ground can be more cheaply broken in sinking, while, other things being equal, the double-width shaft is the cheaper to construct; and while double stations are required, the compactness of each station is an advantage. If we assume single and double-width shafts of four and six compartments respectively, that are regularly framed with 12 by 12-in. timbers, each compartment of which is 5 ft. square in the clear, then the double-width four-compartment shaft will require but 96.5% as much ground to be broken as the single-width shaft, but 92% of the amount of timber will be required and 80% as much lining for the frames as for the single-width, while with regard to the six-compartment shafts but 95.4% as much rock will be extracted in sinking the double-width shaft as in sinking the single-width, while the former will require but 89% as much timber for the frames and 71% as much lining as will the single-width shaft. Therefore, if things are equal and the ground is suitable for the wider frames, the double-width shaft will be the most economical to construct. Where, however, the abnormal pressures due to swelling ground are to be met and resisted, the single-width shaft is to be preferred for the reason that the walls carrying the maximum pressures upon the frames are nearer together and the parts acting to support such pressures are shorter and therefore stronger under end-compression, since the strength of a column under end-compression varies inversely as its length.

There is no question but that by the use of skips of from 5 to 8 tons capacity, running in two compartments of 4 ft. by 4 ft. 6 in. section (which is the ordinary size of compartments of the Butte shafts), 1,000 tons can be hoisted in 24 hr. from varying depths to the limit set by Mr. Burrows. It would, therefore, seem that by dividing the 10 by 10-ft.-shaft in one direction by three 8 by 12-in. buntons, set edgewise with the shaft, as explained by Mr. Storms in his contribution, and in the other direction by a single center bunton, the two hoisting shafts can be properly arranged. This will furnish four equal compartments in the present 10 by 10-ft. shaft, one of which compartments would seem to be superfluous at the greater depths. Since a width of three feet in the clear would be ample for the hanging of all columns and pipes in the pump-compartment, the opposite side of this shaft from the hoisting compartments can be drawn in below the 320-ft. point to a total width of 8 ft. 2 in., thus giving two compartments of a width of three feet with a cross-sectional area of but 1.66 cu. ft. more than that of the projected 5 by 16-ft. single-width shaft. In this way the jog can be avoided, a donkey-hoist can be used in connection with the fourth compartment should it be necessary at any time for pump and other underground repairs, and the shaft can easily be enlarged to a full four-compartment shaft if at any time such enlargement should be deemed advisable. Under the conditions presented by Mr. Burrows I would favor the double-width shaft, although for the sake of additional stiffness and security in carrying the guides and for winding heavy loads, I would cross-brace at the division of the compartments those buntons to which the guides are hung, and for such buntons I would prefer 10 by 12-in. timbers instead of the 8 by 12-in. pieces that would exactly divide the 10-ft. shaft into two 4-ft. divisions. With the bracing of the parts furnished by framed sets, it is certain that ample strength for winding heavy loads would be obtained by the use of 8 by 10-in. timbers or even by the 8 by 8-in. pieces. That such shafts are entirely feasible under practical conditions the ample success of the Whiting or Red Jacket double-width six-compartment shaft of the Calumet & Hecla mines is sufficient proof.

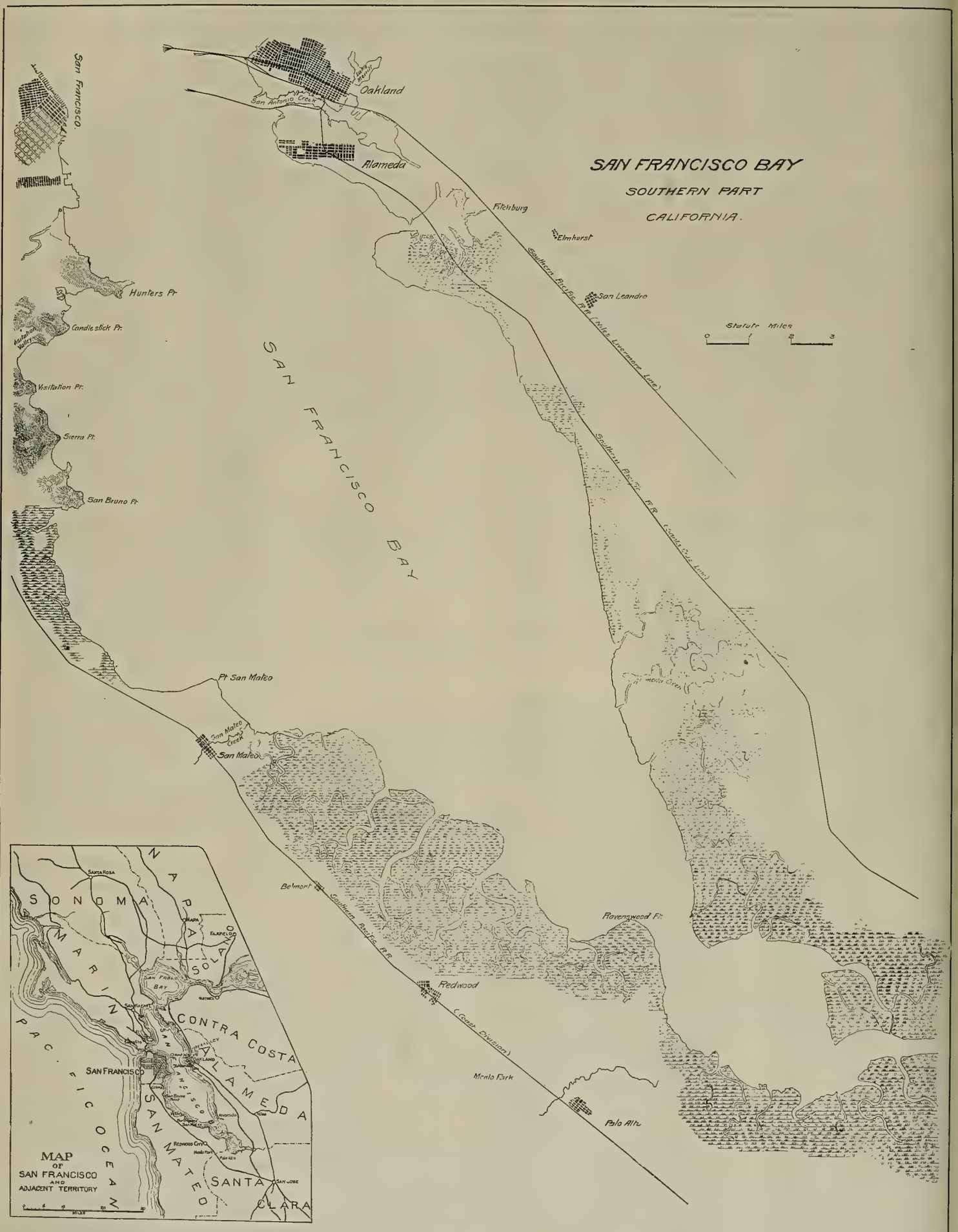
WILBUR E. SANDERS.

Helena, March 16, 1906.

[In regard to the use of two drills on a single bar, Mr. R. V. Norris writes saying that: "There is no difficulty whatever in the use of shaft-bars, at least up to 16 ft. long and carrying two drills. I have used them successfully under these conditions with 4½-in. Ingersoll-Sergeant drills, in ten shafts aggregating 8,780 ft. deep, the smallest of which was 12 by 16 ft. and the largest 16 by 51 ft. in excavation; the rock varied from a soft slate to an extremely hard, white conglomerate. In no instance was it found necessary to use tripods, nor have I heard any complaint of trouble with the shaft-bars." In connection with this discussion we give the size and arrangement of compartments of the Red Jacket shaft, 4,980 ft. deep, of the Calumet & Hecla mine. —EDITOR.]

THE method of handling explosives by the big mines in the Cœur d'Alene, especially at the property of the Federal Company, is commendable. The quantity required for a 24-hour day is thawed in a local outside magazine on wooden shelves by steam or hot-water radiators regulated to a very even temperature. It is handled entirely by one man, who distributes it through the mine between the night and morning shift, while most of the crew is out, where it is placed in short crosscuts from the main levels at some distance from the shaft. These crosscuts are cleaned of refuse daily. They are provided with an incandescent or covered light, and protected with heavy slat wooden doors that are kept locked, and nobody carries a key to them but the powder-man and shift-boss of the level, who hands out the powder, at shooting time, in small canvas sacks supplied with a loop or lap by which they can be swung over the miner's shoulder, giving him both hands free to climb with and handle his light and primer. Caps and fuse are always kept at considerable distance from powder stores.

AN extremely simple method of cutting a gauge glass is described in the *American Machinist*. It consists of taking a match, cutting it and thoroughly wetting the head. Then, after measuring the glass, put the wet match head inside the glass where it is to be cut and turn the glass several times until a ring is formed on the inside. Now hold a lighted match under this mark and the glass may be easily separated at the desired point. This method of cutting the glass should be more accurate than using a file to mark and break off the glass.



MAP SHOWING SITE OF THE NEW COPPER SMELTER.

The New Smelter.

On the opposite page we publish a map of San Francisco bay showing the site of the new copper smelter about to be erected. It is on the east end of San Bruno point, nine miles south of San Francisco, on the west shore of the bay. While the depth of water at this spot is only five feet and the locality is on the side away from the main railroad terminals, this site has been selected for the specific purpose of creating the minimum of annoyance.

The records of the weather bureau show clearly the direction of the prevailing winds; the tabulated statement which follows, gives the percentage of wind from the several points of the compass during five successive years:

Year—	North.	NE.	East.	SE.	South.	SW.	West.	NW.
1900	7	3	2	7	6	27	34	9
1901	11	2	2	8	5	28	36	7
1902	9	3	2	10	7	17	44	7
1903	12	4	2	8	4	16	43	9
1904	9	4	2	9	5	17	42	11

These figures speak for themselves. It remains but to add that in case of a westerly wind, which blows nearly half the year, the distance across the water, due east, is 14 miles; in case of a northwest wind, that is, during about a quarter of the year, the distance from San Bruno point to the marshes at the southern end of the bay is 27 miles. When the south or southeast wind blows toward San Francisco, the smoke will be deflected by the mountain, 1,100 ft. high, which crosses the peninsula just north of the smelter, so that the fume will be dispersed over the water. The northerly wind will take the smoke toward San Mateo and Burlingame; these are pleasure resorts and places where many of the wealthy have built beautiful country houses. From them come already protestations. But the wind that blows their way prevails only for about ten per cent of the time and never longer than 10 hours at a stretch, so that the nuisance will not be serious. During those rare periods when the air is slightly tainted, such men as D. O. Mills, Charles W. Clark and Walter Hobart will do well to remember how much of their wealth they owe to metallurgical processes, and if they are philosophic they will regard the whiff of sulphurous smoke as the incense blown from the altars of their prosperity. This matter is discussed at length on our editorial page.

To the community as a whole the establishment of this smelter is an event of pleasing importance. It will build up a town of several thousand people and, by treating 45,000 tons of charge per month, it will stimulate mining in all the States tributary to the Pacific coast. While it is designed to treat copper ores, the smelter will, of course, afford a market for the dry or silicious ores to be mixed with copper sulphides. San Francisco will benefit directly, for the tonnage mentioned—and this is likely to be increased—will represent the turning over of, say, half a million dollars per month in ore and half that amount in wages and supplies. The money that comes here in connection with this business is more likely to stay than in almost any other part of the world, because California is a country of homes—and homes, like smelters, require a modicum of money for their comfortable operation.

Separating Iron From Tin.—An ingenious method is now employed at the Loudon mill, Irvinebank, North Queensland, to separate the iron from the tin concentrate. The ore from the Vulcan mine contains magnetic iron, and the trouble always was to eliminate so undesirable a substance. The specific gravities of the tin and iron, however, so nearly approximate that separation was exceedingly difficult, and was never satisfactorily accomplished. James Tunnie, assayer to the Irvinebank Tin Mining Co., owners of the mill, proposed using electricity to overcome the difficulty, and with John Moffatt, who takes a keen interest in ore dressing, a scheme was evolved. Water containing the tin and iron was highly charged with electricity, which increased the magnetic influence of the iron, and this created cohesion between the iron particles. The ore was then run over vanners, and the united iron particles, irregularly joined, offered much greater resistance to the water, and were more affected by the vanning motion than the close-lying tin. As a result separation was easy, the iron particles readily leaving the table along with the lighter material.—*North Queensland Register.*

The gold output in South Africa for January and February was 836,306 fine ounces, as compared with 733,069 for the same period in 1905, and 578,326 in 1904, and 151,746 in 1902. The employment of additional Chinese labor has been stopped, which may check the increasing production. It has caused a heavy fall in South African shares, as there is a possibility that the Chinese already there may be sent home.

Spring and well waters contain in 10,000 parts about $\frac{1}{10}$ part solid matter, consisting largely of lime salts. Well-water that contains much lime is called hard. Well-water also contains some carbonic acid and air in solution, both of which give it its refreshing taste; distilled water tastes flat.

Iron vs. Wood for Cyanide Leaching Tanks.

Written for the Mining and Scientific Press by Francis L. Bosqui.

The following facts in regard to iron and redwood leaching tanks for the cyanide process will determine which type is best to use in a given locality.

In warm countries, where the winters are not severe enough to require housing the plant, the iron tank is to be preferred. Iron tanks are more expensive in first cost and erection than redwood; they are also more expensive to maintain, owing to the necessity of frequent coating to protect both the iron and the cyanide solutions. They must be set up with special care and subjected to water-tight test, as leaks are difficult to stop, especially in the bottom, after the filter has once been laid. A serious objection, not generally recognized, is the lack of rigidity of iron tanks when under pressure of a charge of ore, and the tendency of the periphery to shift from the line of the true circle. This shifting or bulging will take place during the filling or after solution is applied, and is due to the charge not being uniform in density and of varying pressure at different points. Such a variation, with the consequent yielding of the iron, will oftentimes produce cracks throughout the charge of sand. This prevents uniform percolation and is a serious matter. It can be prevented, however, in great measure by using sufficiently heavy material and reinforcing the tanks with bands of angle iron.

The redwood tank is perfectly rigid, and is much cheaper in first cost and maintenance than the iron tank. It does not require as frequent coating with protective paint. There is a popular prejudice against wooden tanks owing to their alleged greater liability to leakage, and their absorption of values. The leakage may be prevented by good workmanship in setting up the tank. The redwood leaching tanks at the Smuggler-Union cyanide plant in Colorado are 40 ft. in diameter, and are absolutely tight; and I am quite positive that the same may be said of the large 54-ft. tanks at the Homestake. Rare cases have been reported of losses from absorption. I investigated this point several years ago. The results of the tests made on that occasion are quoted herewith from my article in *The Engineering & Mining Journal* of February 26, 1898.

A piece of redwood 5 ft. 2 in. long and 2½ in. thick was submerged for three weeks in a gold solution at Bodie. Weighing before and after submersion showed an absorption of 2⅜ lb. in 80 hr., equal to 22% of the original weight. Assuming that a tank weighing six tons would absorb as much as 50% of a $5 cyanide solution, the absorption would amount to three tons, or $15—an almost imperceptible loss in a plant treating several thousand tons per month.

Another way to account for loss of gold by absorption is to assume that the absorption is cumulative—that is, in a leaching vat submitted to intermittent contact with solution, the gold is deposited in the wood by a series of partial evaporations. To determine which was accompanied by the greater loss by absorption — continuous or intermittent contact—and whether either was responsible for any considerable loss, the following tests were made:

First series (continuous contact).

A. A piece of dressed redwood, thoroughly seasoned, weighing 2 lb. 2 oz. and exposing 180 sq. in. of surface, was submerged for three weeks in a solution carrying an average of $5 per ton in gold. The wood was then taken out and dried, and reduced to charcoal in a clean solder stove and further reduced to ash in a new assay-muffle. The ash was carefully fluxed, cupeled, and the button weighed, with the following results, silver being valued at 50c. per ounce:

	Gold.	Silver.	Total.
Actual absorption....mg.	1.65	2.75	4.40
Absorption per ton of wood....grams	1.552	2.588	4.14
Value absorbed per ton of wood....	$1.03	$0 01	$1.07

B. A piece of seasoned dressed pine weighing 3 lb. and exposing 180 sq. in. of surface was submerged at the same time as the redwood and subjected to the same conditions:

	Gold.	Silver.	Total.
Actual absorption....mg.	1.7	2.6	4 3
Absorption per ton of wood....grams	1.133	1.733	2.866
Value absorbed per ton of wood....	$0.75	$0.02	$0.77

C. A piece of rough pine weighing 2 lb. 7 oz. and exposing 144 sq. in. of surface was taken from the bottom of a discarded screen-frame, which had been constantly and directly exposed to a strong solution (averaging $5 per ton in gold) for a period of eight months, and again for a period of four months:

	Gold.	Silver.	Total.
Actual absorption....mg.	9.5	10 8	20 3
Absorption per ton of wood....grams	7.794	8 86	16.654
Value absorbed per ton of wood....	$5.18	$0.14	$5.32

Second series (intermittent contact).

A. A piece of dressed redwood weighing 2 lb. 7 oz. and exposing 180 sq. in. of surface was subjected to intermittent submersion in a strong gold solution for three weeks. The piece was left in the liquid for 16 hr. in 24, and then removed and dried in the sun for the other eight hours:

	Gold.	Silver.	Total.
Actual absorption....mg.	4.8	2.1	6.9
Absorption per ton of wood....grams	3.657	1.6	5.257
Value absorbed per ton of wood....	$2.43	$0.02	$2 45

B. Two pieces of rough pine, weighing together 3 lb. 4 oz. and exposing each 160 sq. in. of surface, were taken from near the top of the disused screen-frame from the gold tank. This portion of the frame had been alternately exposed and dried for 12 months, and was probably about one-half of the time under solution:

	Gold.	Silver.	Total.
Actual absorption....mg.	6.7	13.7	20 4
Absorption per ton of wood....grams	4 122	8 429	12 551
Value absorbed per ton of wood....	$2.74	$0.13	$2 87

It may be noted that the portion of the screen-frame subjected to long continuous submersion showed the highest absorption—$5.32 per ton of wood—and that the piece of redwood exposed intermittently to solution for three weeks indicated almost the same degree of absorption as the top portion of the screen-frame exposed for several months.

The indications are that in no case would the absorption be much of a factor in gold losses, even in a vat of unprotected surface.

Origin of Coal.

Coal is a rock of organic origin, containing oxygen, carbon, hydrogen, and other constituents. If air be admitted to vegetable substances, when at a high temperature, they take up oxygen and are gasified; and if heat be applied without air, as in a retort, the hydrogen and oxygen are driven out, and the carbon remains. This process is known as dry distillation, and in this way coal has been formed from land and water-plants, especially the latter. The clay-slates, containing mica and potash, afforded a rich soil, and the moisture in the air fostered the growth of the plants. As the more perishable decayed, they furnished nitrogen to plants of higher organization, such as *sigillaria* and *lepidodendra*, in which the coal measures are rich. A subtropical climate, with a temperature of 68 to 77° F., seems to have been universal, and an atmosphere charged with carbon dioxide and water-vapor. To secure this moderate and equally diffused warmth, it has been supposed that the climate was independent of the earth's position toward the sun, and that the inclination of its axis was not so considerable as it is now. This luxuriant vegetation was probably transformed into coal in its original position.

When air reaches a dead plant, and it cannot be gasified by oxidation, a substance known as *humus*, containing carbon and lime, is developed inside the plant-cells. *Humus* is found in peat, and it is in the growth of peat, in which bubbles of carbon dioxide and marsh-gas rise to the surface of bogs and burst, that the formation of coal may still be studied. In the process of carbonization, the gases of marsh-plants, hydrogen, oxygen and their compounds, were driven off, and this is still going on in coal mines; in the later brown coal-seams, carbon dioxide, and in the earlier stone coal seams, marsh-gas was liberated. Upon this fossil and carbonized vegetation strata of clay and sandstone supervened, heat was generated, the pressure was high, the water rapidly driven out, and dry distillation with decomposition took place. The slower the process, the poorer was the coal in oxygen and hydrogen, and the richer in carbon. Geological upheavals, dislocations, faults, etc., caused different degrees of carbonization, and where the pressure was greatest the coal was converted into anthracite. Bituminous coal is of later formation, and brown coal still more recent. The quality and heating value of the latter varies greatly, showing that it was carbonized at different stages; but all brown coal is low in carbon and contains a high percentage of water and ash. Lignite, the latest of all coal, still retains its woody structure.

The origin of coal and peat has been ascribed to fermentation, and a certain similarity in the process of generating alcohol and stone-coal, and in the products, has been pointed out. The writer considers that this applies only to the earlier stages in the formation of coal, and that the temperatures attained are too high to allow of the working of fermentation-agents.

The spontaneous combustion of coal cannot take place without heat, and the presence of oxygen or air and the process of generating the one and absorbing the other is known as oxidation. Heat is a movement of atoms and molecules, increasing their distances from each other, and the marsh-gas, carbon dioxide and nitrogen, enclosed in the pores of the coal, are liberated. Pyrite, in the coal, also favor spontaneous combustion. It is oxidized into sulphurous and sulphuric acids, the heat developed by chemical action dries and heats the coal, and if air be admitted it ignites and burns.

Coal absorbs atmospheric air, condenses it, and increases in weight; while, if disintegration continues, the weight falls, carbon dioxide and hydrogen are set free, and the heating value of the coal is reduced. The capacity of a given coal for spontaneous combustion may be determined by the amount of bromide with which it is able to combine. The chief substances in the coal which contribute to combustion by their readiness to unite with oxygen are the hydrocarbons, and the oils produced during natural decomposition.—F. Janda, *Osterreichische Zeitschrift, B. und H.*

The Effect of a Snowslide.

Written for the MINING AND SCIENTIFIC PRESS by STEPHEN L. GOODALE.

On Saturday evening, March 17, 1906, at 7:10 P. M., a snowslide demolished a large portion of the stamp-mill of the Camp Bird, Ltd., at Ouray, Colorado. For a number of days previous the fall of snow had been exceptionally heavy and continuous; so that the depth of freshly fallen, unpacked snow was very great, and was the cause of the unusual violence of this and many other slides in the neighborhood.

The slide ran straight from the top of Mt. Hayden, in its course taking out first some thirteen towers on the wire-rope tramway; then, leaping down a high cliff, it struck the hillside, and took out several warehouses, a coal-shed and large water-tank above the mill and wrecked the mill itself. Lastly, a small bunk-house, about 200 ft. from the stamp-mill, was struck with sufficient force to crush in the lower story on one side, and was saved from more complete destruction only by a large rock that split the slide and reduced its force before the house was hit.

The lower story of the bunk-house had been devoted to a reading-room. Seven men were caught there in the snow and debris, but all were rescued in a short time and without serious injury.

Electric power lines and all other wires to the mill had been taken down by slides elsewhere earlier in the day; so, as the mill was not running, only three men were inside at the time. One of them, Andy Eke, was untouched, though caught in the wrecked portion of the mill; one, Strickland, was dug out some two hours later from under about three feet of snow and timbers, with only slight bruises; and one was killed outright. Eke was too scared to answer the calls of the rescue party for some minutes. Strickland said that after the first warning crack, he would have had time to yell—but no more—before he was buried; and that he did not even yell, so quick was it. Most of the noise made by the slide was the cracking of timbers in the buildings struck. Many of these slides run with but little noise and with no previous warning. I saw the so-called 'water-hole' slide—whose path is down the side of Mt. Hayden into Cañon Creek, run, at 3:20 that afternoon, from the mill, a distance of perhaps a half mile. This was a big slide, and took out all the wires to Ouray, but there was practically no noise from it audible at the mill, though the whole cañon quickly filled with a mist of snow, which was some minutes in clearing.

Fig. 1. Stamp-Mill Destroyed by Slide.

Strickland was dug out of the snow by the Huntington mill on the extreme right of this photograph.

Accompanying photographs show something of the condition of the stamp-mill and bunk-house after the slide. The two warehouses were carried onto the vanner floor of the mill and nearly buried there under snow. The boiler-house and the end of the stamp-mill next to it were not destroyed. The opposite end of the building, housing four Huntington mills, was completely wrecked. A middle section of the mill was knocked out entirely, and between this and the Huntington end, a section, housing 20 stamps, was left partially standing. The step-like affair in the middle of one photograph (Fig. 1) is an overturned piece of roof; to the right of it can be seen one end and the roof of warehouse No. 1, which formerly stood 200 ft. up the hill on a spot a little to the right of the area included within the photograph. The bunk-house was left standing, one side crushed in below. See Fig. 2.

The slide ran in a well-defined track through the forest, but had never been known to run with anything like the force and volume it had on this occasion; and the site of the Camp Bird mill had been generally considered to be one of the safest places in the San Juan, so far as this particular danger was concerned. Snowslides resemble unloaded guns. They usually run in certain known places and not elsewhere. Unloaded guns usually do not go off. When either abandons its habits something is apt to be doing.

At the Camp Bird mine a huge slide tore out some of the timber sheds, but did no further damage.

Fig. 2. Bunk-House, the Day After.

On Tuesday morning, between 1 and 2 A. M., fire was discovered by the night watch in the upper part of the boiler-house, and all of the stamp-mill that had been left by the slide was totally destroyed by the flames. It was only with great difficulty that the concentrate dryer, connected with the stamp-mill by the overhead passageway shown to the left in Fig. 1, the machine-shop and the blacksmith-shops and cyanide plant were saved from burning; as the water-storage tank used for fire protection had been destroyed by the slide, and only a tank of water used for the cyanide mill was available. The destruction of the stamp-mill and boiler-house by fire was complete. For three or four days in certain parts of the smouldering ruins the odor of quicksilver was very strong. The amalgam on the battery plates was pretty thoroughly parted and the 'quick' driven off, leaving a gold plate on the copper. In the clean-up pans most of the amalgam had also been parted, and the gold was left as a well-retorted dirty sponge; but a little amalgam and quicksilver were also left.

The cyanide mill was not injured by either avalanche or fire. The slope of Mt. Hayden is such that a slide starting above this mill would be deflected by a shoulder of the mountain and turned to one side or the other. The work of clearing up is already under way, and the construction of a new mill will be pushed as rapidly as possible.

PANAMA CANAL.—The total volume of excavation for the sea-level plan is estimated at 231,000,000 cu. yd., of which 110,000,000 yd. is in the Culebra cut, 8 miles long. For the lock canal project the total quantity of excavation in the Culebra cut is reduced to less than 54,000,000 cu. yd. It is estimated that the construction of the Gatun locks, which will require 3,660,000 cu. yd. of excavation and 1,300,000 cu. yd. masonry, will take about as long a time as the excavation of the divide cut. The total estimated cost of constructing the lock canal recommended in the minority report is in round numbers $140,000,000; and the time necessary is estimated at seven and one-half to nine years. In comparison, the estimate of the majority of the Board for its sea-level project is $247,000,000, and from 12 to 15 years is the estimate of time required for its construction. It should be stated here, however, that both these estimates are for a much deeper and wider canal than any heretofore contemplated. This increase in dimensions is made necessary by the wording of the Spooner Act, which provides that the canal "shall be of sufficient capacity and depth as shall afford convenient passage for vessels of the largest tonnage and greatest draft now in use, and such as may be reasonably anticipated." The Isthmian Canal Commission of 1901 proposed a canal with a bottom width of 150 ft. and a depth of 35 ft. This was, it may be noted, a great increase over the original De Lesseps project, which was for a canal 29.5 ft. deep with a bottom width of 72 ft. The lock chamber adopted by the 1901 commission was 84 ft. in width and 740 ft. in length.—*Engineering News.*

A FREAK of giant powder was witnessed by the crew of the Congress Consolidated Mines Co.'s train in Yavapai county, Arizona, recently. They were taking up a lot of powder on the little train and in a low-sided box car. In some manner a box of the powder was caused to fall from the car and roll under the wheels. The box containing the powder was cut in two pieces and two sticks of the dynamite were exploded, but the remainder of the powder refused to join in the disturbance, which would have resulted in great damage and perhaps fatally to the men on the train, as it is likely that if the broken box had exploded the other powder on the car would have followed suit.

The Assay of Cyanide Solutions.

Written for the Mining and Scientific Press by William Magenau.

About a year ago I had occasion to search for an extra rapid method for determining gold in cyanide mill solutions, to be used in controlling the operations of an agitation plant which handled charges of 100 tons each. The process involved special chemical treatments, and washing by decantation; and a quick solution-assay was imperative right through. As a basis, I gathered from textbooks and files of the technical press all suggestions along this line, and tried but a few before finding one which, with some modifications, answered well.

It may interest cyaniders to know this method, especially as they may have had the same discouraging experience as I had with the method as published. It was described in the *Engineering and Mining Journal* of March 28, 1903, by Alfred Chiddey; in substance it was as follows: Add to four assay-tons (or more) of the solution 10 c.c. of 10% solution of lead acetate; then four grams zinc shavings; boil a minute; add 20 c.c. HCl (strong). When action has ceased, boil again and decant from the ball of spongy lead which has been compacted a little with a glass rod, and wash same by decantation. Transfer to a piece of filter-paper, roll into a compact ball, and place (without drying) on a hot cupel in the muffle.

Mr. Chiddey states that a result can be obtained in 25 min., which I failed to confirm. It is certainly the experience of most of us that it requires several times that length of time to bring four assay-tons (120 c.c.) of solution twice to a boil, to *dissolve four grams Zn in HCl*, to conduct a cupellation, then part and weigh, to say nothing of manipulation. But far from making any speed records, I could not get the method to work at all, following the scheme to the letter. Instead of the lead coming down spongy, it was finely divided and showed no tendency to agglomerate, and had to be filtered out to collect it at all, which it was the very merit of the proposed method to avoid. But the precious metals were perfectly precipitated, and realizing the advantages of the scheme, I experimented with other proportions of reagents than those given and got good results from the following:

Take in a large beaker (about 600 c.c. capacity) five or ten assay-tons of solution, and if it is very weak in KCy add enough of strong pure solution to bring it up to about 0.5% strength. Add 10 c.c. of a 10% solution of lead acetate, slightly acidified with acetic acid (12 c.c. if 10 assay-tons were taken); then add by rough measure on the point of a spatula between 0.3 and 0.4 gram (not more) of zinc dust, this being sufficient to precipitate all lead present and leave an excess of zinc to act on Au and Ag. Stir and bring to a boil; then add 15 c.c. strong HCl and leave on the hot plate until excess Zn is dissolved and lead has gathered into a sponge. This will take but a few minutes, and the assay should then be taken from the heat, else the lead will begin to dissolve. Now gather the lead a little with a glass rod whose end has been flattened while hot, or with the fingers encased in a rubber cot, decant rapidly, wash by decantation two or three times with large quantities of water, pick up the lead (which should be soft and strongly inclined to stick together when pressed) in the fingers and compress it into a ball, which place upon a piece of lead foil 1½ in. square. (Using filter-paper instead of lead-foil, the spongy lead is apt to separate in the cupel). Fold up in such a way as to leave an egress for steam, and drop into a hot cupel in the muffle, having first added a bit of silver, if the assay is for gold only.

The solution on which this method gave excellent results, and checked perfectly with the old evaporation methods in minimum time, carried about 0.075% KCy and from nothing to one ounce Au per ton with almost no Ag. It is possible that Mr. Chiddey's method, as published, works better on other solutions, though it is not clear why so much as four grams zinc need be used, taking a long time to dissolve, when one-tenth as much, in the shape of 'dust,' is ample. Perhaps different proportions of reagents will be necessary to suit each case, but operators will find it worth a little experimenting to secure a method which involves no filtration, no fusion nor scorification, is accurate and rapid, easily performed and equally suited to large batches and single assays.

The method may be used without application of heat, as the precipitation of precious metals is perfect in the cold, but the lead does not agglomerate well and the excess zinc takes longer to dissolve. When done this way, the precipitated lead (plus Au and Ag) must be filtered out and the paper, unwashed and still wet, rolled up in a piece of lead foil about two inches square and dropped into a hot cupel.

It may be of further interest and a convenience to have the list of methods which I gathered, chiefly from the American technical journals of the past eight years; cyanide chemists may be encouraged thereby to give them a trial, and let the profession know the results. Gold determination has been the chief concern, but these methods, except where noted to the contrary, may be used equally well for silver.

I. METHODS INVOLVING CRUCIBLE FUSION OR SCORIFICATION BEFORE CUPELLATION.

1. *Evaporation* in a lead-foil tray, either direct, or after concentration to small bulk in a porcelain dish, the finish to be conducted at a very low heat. The tray is rolled up so as to enclose the residue, and is scorified with test lead before cupellation, parting and weighing. With small charges (say one assay-ton) of solution carrying only small amounts of dissolved matter, the scorification can be omitted. A variation of the method which avoids the lead tray, is to sprinkle into the charge of solution (in a porcelain dish) 20 grams litharge, in such a way as to cover the bottom; then evaporate to dryness, and scrape the residue with a spatula into a crucible containing 10 grams sodium bicarbonate, five grams borax glass and one gram flour or argol. The dish can be thoroughly cleaned by moistening with dilute nitric acid and mopping out with small pieces of filter-paper which are added to the crucible. Fusion results in a lead button, which is cupelled, etc. The evaporation method is the oldest in use, and when carefully done is accurate. It involves much time, but little and simple manipulation.

2. *Precipitation as Sulphide in Acidified Solution.*—This is given in the *Engineering and Mining Journal*, November, 1898, by Henry Watson, and is stated to be quick, accurate and economical.

Acidify five or 10 assay-tons solution with HCl and heat to boiling; while boiling, add a solution of two grams lead acetate and pass a current of sulphuretted hydrogen until all Pb is precipitated. Allow to cool a little while, still passing H_2S, then filter, precipitate, dry and reduce to a lead button by either scorification with lead test or fusion with fluxes in a crucible; cupel, etc.

3. *Precipitation by Cement Copper in Acid Solution.*—Albert Arents in *Trans.* A. I. M. E., Vol. XXXIV, p. 182: Add a few cubic centimeters H_2SO_4 to six or eight assay-tons of solution, stir well, and add one gram (not much more nor less) of commercial cement copper. Boil hard for 10 min. Filter through a large gray paper without washing. Place in an assay crucible one-third of a fluxing mixture consisting of 30 grams litharge with usual amounts of soda, borax and reducer, and on the drained filter, another third. Then pick up the filter, tuck it into the crucible and cover with the remaining third of flux. Now fuse, cupel, etc. Instead of cement copper, a solution of $CuSO_4$ may be added and then some aluminum foil. Boiling the assay for some time brings down the copper. The aluminum foil should be added to the fusion of filter.

4. *Precipitation by Silver Nitrate.*—Credited to A. Crosse on p. 161 of Gaze's book on the 'Cyanide Process.' Add an excess of silver nitrate solution; filter and wash; dry filter and either scorify it with test-lead after incineration, or fuse with fluxes in a crucible, cupelling the resultant lead button. This method, of course, can be used for Au only. Gaze also gives a modification of this which employs a bichromate of potash indicator to determine when there is an excess of Ag NO_3, and directs that a few grams of zinc-dust be added beside. After stirring well, an excess of H_2SO_4 is added. Then filter and wash, dry, fuse and cupel; or the incinerated filter may be cupelled direct when wrapped in lead-foil. Mercuric chloride may be used instead of silver nitrate.

5. *Precipitation by Copper Salt.*—Maurice Lindemann in *Engineering and Mining Journal*, July 1, 1904. Heat 10 assay-tons until quite hot: add ammoniacal copper nitrate solution to a permanent blue; carefully acidify with H_2SO_4; stir and filter immediately. Dry and incinerate the filter, fuse or scorify, cupel, etc. Some chemists claim this method will not work on foul solutions

Grant D. Miller in *Engineering and Mining Journal*, June 23, 1904, treats 34.3 assay-tons (one liter) of solution in a two-liter flask with one to two grams copper sulphate. After shaking well, add 10 to 15 c.c. strong HCl and shake well again. Filter, dry, and incinerate, fuse, cupel, etc., as before.

6. *Precipitation by Zinc Shaving or Dust in Acid Solution.*—H. L. Durant in *Jour. Chem. & Met. Soc.* of S. A., December, 1902. Place a large measured bulk of solution in a flask, acidify strongly with H_2SO_4 and bring to a boil. Add 30 grams zinc shaving, about five grams at a time, waiting with each addition until all that previously added is dissolved. Keep solution strongly acid throughout. When all has been added and dissolved, put in one gram precipitated silica to collect floating matter, filter through double papers, dry and char the papers on a scorifier, and then add test-lead, scorify and cupel. This method can be used for Au only, since Ag dissolves as sulphate.

A much more practical method is used in the Black Hills and elsewhere. To eight assay-tons of solution are added enough silver nitrate solution to furnish inquartation for gold; then 0.33 to 0.5 gram zinc-dust and sufficient H_2SO_4 to react completely, say 5 to 10 c.c. Stir a little and filter through an ordinary paper, dry, incinerate, and fuse in a crucible with litharge and reducer for a lead button, which is cupelled, etc.

7. *Precipitation by Emulsion of Zinc-Dust in Lead Acetate.*—This method was used in some large mills in Colorado a few years ago, but I am unable to give more than a bare outline, and do not know how it will work out. Make a thin paste of zinc-dust in a strong solution of lead acetate and add about 8 c.c. of this to 20 or 30 assay-tons of solution. Agitate and let stand for a time. Filter and add dilute H_2SO_4 to the filter and wash. Dry, filter, incinerate, fuse with litharge (or scorify with test-lead) and cupel, etc. This is virtually the same as suggested for cold treatment of the modified Chiddey scheme, already described, though differing in manipulation.

II. METHODS WHICH GATHER PRECIOUS METALS IN LEAD THAT CAN BE CUPELLED DIRECT.

1. *Evaporation* either conducted entirely in, or finished in, a lead-foil tray, when solution is comparatively small in amount (one to two assay tons) and contains only small amounts of dissolved salts [see I (1)].

2. *Chiddey Method*, or modification described. This seems to be really the only method properly and exclusively in this class.

III. COLORIMETRIC METHODS (for gold only).

1. *By Stannous Chloride Following Precipitation and Re-solution of Gold.*—Prister in *Jour. Chem. Met. & Min. Soc.* of S. A., December, 1903, gave a method which would seem too long for practical use. He adds to the acidified and boiled solution under assay a few cubic centimers of a 10% solution of $CuSO_4$ containing 20% NaCl, and acidified with acetic acid after having been boiled 10 min. with copper shaving and cooled. The precipitate resulting from addition of this reagent is filtered out and re-dissolved in a KCy solution, and to this is added a half gram of zinc-dust. After agitation for a few minutes, this is filtered off and treated on the filter with dilute HCl. Treatment of the same filter with aqua regia (minimum quantity) dissolves the gold, and in the solution an excess of strong stannous chloride solution gives the 'purple of Cassius' test, which may be compared with standards.

Later Prof. Prister published a simplification of this scheme which reads better. The solution under test is brought up to 1% KCy. To 234 c.c. (eight assay-tons) add one gram zinc-dust and heat to boiling. Filter; pour on filter 20 c.c. hot 10% H_2SO_4, repeating until all the zinc is dissolved. Treat residue on the filter with 10 c.c. hot aqua regia (6HCl, $2HNO_3$, 6 water), passing the 10 c.c. repeatedly through same filter at a boil. Collect in a test tube, cool and add a "few drops" stannous chloride as before. Prof. Prister does not say how he avoids disintegration of the filter by action of hot aqua regia. From work I have done with 'purple of Cassius' tests on aqua regia solutions of gold, good and constant colors cannot be obtained unless the acids are present in small amounts and a large excess of stannous chloride is used.

2. *With Stannous Chloride Without Previous Precipitation of Gold.*—Henry R. Cassel has given a promising quick test as follows: To 10 c.c. of solution in a test-tube is added 0.5 gram potassium bromate, then pure strong H_2SO_4 slowly until action starts. When action has ceased, add drop by drop a strong solution of stannous chloride, until the solution is just colorless. In about half a minute the purple color will form. Mr. Cassel says the test can be performed in three minutes, and is delicate to a value of a few cents per ton of solution. By concentrating by evaporation very low grade solutions or diluting those too strong in gold, this method may apply to a wide range.

He also used other agents than potassium bromate as a destroyer of the interference of cyanogen, namely, potassium chlorate and HCl, or H_2SO_4, with long boiling; potassium bromide followed by sodium peroxide and neutralization with H_2SO_4, after which HCl and stannous chloride are added to give the color. This last acts well. Another scheme is to add to the solution one-third its bulk of strong ammonia and then neutralize with strong H_2SO_4. The solution will then react with stannous chloride. For quantitative work, standards must be prepared, and to make these durable is a great difficulty of the method. Considerable skill is also needful.

IV. ELECTROLYTIC METHODS.

1. *Deposition on Lead.*—In *Trans. Inst. of Min. & Met.*, May 16, 1905, F. B. Stevens gives a method which does not appear to possess any advantages over the chemical processes in points of time, convenience or accuracy. Fourteen to twenty assays of 10 assay-tons each (292 c c.) are electrolyzed by current from 110-volt lightning main for four hours, using a lead-foil cathode of cylindrical shape 2½ in. high and 1 in. diam., with three V notches around the bottom, and a large iron nail for anode. To each assay 12 to 15 c.c. of strong ammonia is added. The cathode should be covered with one-half inch of solution. Twenty assays give just right resistance, and with less than 14, electric lamps must be put in circuit. With a current varying from 0.06 to 1.2 ampere, according to foulness of the solution, the gold comes down bright. The cathode is washed, dried, rolled up and scorified with test-lead before cupelling.

The only figures given for completeness of precipitation state that a solution carrying $10 to $15 in gold will be cleaned to about 10c. in four hours. If this is the best that can be done, the method is not

applicable to low-grade solutions. It would seem that cupellation of the cathode might be made without preliminary scorification.

It will be noticed that for most of the above methods charges of 10 assay-tons, or less, are recommended, which will perhaps seem inadequate to some, particularly South African operators. Most English authorities (as Julian and Smart) insist that only very large charges be used. The authors named say not less than 30 assay-tons and up to 200. In America balances can readily be purchased which are sensitive to 0.01 mg., or even one-fourth of this. Taking the former figure, 200 assay-tons would give gold results accurate, so far as the weighing is concerned, to 0.001 per ton. What conceivable use such a degree of precision can be is not stated. Even 30 assay-tons would weigh down to 0.007, which is far finer than available methods of sampling and measuring ore and solution tonnages justify. Ten assay-tons give a bead weighable to 0.02, and nothing beside investigation work need be concerned with less than this.

The Wunsan Mines of Korea.

Written for the MINING AND SCIENTIFIC PRESS by W. G. ANDERSON.

Occasionally we hear of the mining that is being done by the Oriental Consolidated Mining Company, but little is known of their history and the difficulty and hardships in getting the enterprise properly started, on account of the remoteness of the locality and the difficulty of teaching the natives modern mining methods. This was a task greater than the ordinary man's ability. To Leigh Hunt, H. F. Meserve, Dan Buckley and Duff brothers belongs the credit. They were the pioneers. The writer, though not one of the first, was a close follower.

Teaching the natives how to use the shovel was one of the hardest tasks. Their language was difficult to learn, but it has been mastered, and in a comparatively short time the Koreans have become good miners, engineers and blacksmiths. The Korean method of working a mine is to build a fire on the ore, and, when it gets hot, to throw water on it for the purpose of breaking it; then it is carried to a flat stone, where it is ground by a half-rounded stone with two poles lashed to it so that two men can rock it, while another man feeds the ore between the stones; when ground fine enough, the pulp is panned to recover the gold. The natives worked their mines by such methods to the water level. At some of the mines there were thousands of natives working in this way.

Shortly after the war between Japan and China, the Emperor of Korea concluded to work the mines with modern machinery. He employed two white men, purchased a 10-stamp mill, with 600-lb. stamps. It was a very inferior mill, an old rattle-trap. The two men employed proved incompetent; they consumed a great amount of time in getting the mill to the mines. Not having the ability to set it up, the Emperor discharged them. About this time Mr. Leigh Hunt arrived in the Orient. He personally examined the mines, obtained a large concession from the Government, erected the 10-stamp mill at Chittabalbie, set up a whim, which was worked by a bull, sunk the Korean shaft, which was noted for its crookedness, and raised the water with hand-pumps. The pumping was done in stages, lifting the water to earthen crocks set at intervals in the shaft, not having barrels for this purpose. In this way, eventually a level was cut below the Korean workings. Shortly after the mill started the cam-shaft broke; a new one was needed and San Francisco was the nearest place where one could be obtained. It reached Chemulpo all right, but here it had to be re-shipped on a junk, which sank within 40 miles of the mines. Despite these and hundreds of other difficulties, they have conquered. They have now 200 stamps running on their concession. They have taught the natives how to mine and opened the country, so that now its great mineral wealth can be easily extracted.

Korea has many inducements to the mining world, in copper and gold, with the advantage of good and cheap labor; also a healthy climate. The pioneers have blazed the trail.

LEAD is used medicinally mostly for external applications for disorders of the system that manifest themselves upon the skin. Lead acetate is an internal remedy for certain fevers. Lead carbonate and lead iodide as well as lead oleate are used in ointments, plasters, etc.

Labor in Mexican Mines.

Written for the MINING AND SCIENTIFIC PRESS by EDWIN H. DAVISON.

The hiring of labor in Mexican mines and the manner of its employment is very different from the practice in the United States. Time books, as we understand them here, are seldom, if ever kept, as the men are engaged by the day or shift and paid upon its termination. There are two systems in vogue, and in each the same idea of daily engagement and liquidation are carried out. Men working on *raya*, as day's pay is called, to distinguish it from contract work (which is let by the month or other stated time) are hired at the commencement of the shift by the shift-boss. All men and boys who wish to work on the shift assemble at the mine entrance and to those selected are issued candles, hammer, scraper and drills. The Mexican miner preparing to go on shift divests himself of his clothing, retaining only a breech-clout, a pair of crude leather sandals and his inseparable *sombrero* or sugar-loaf hat. These hats in shape all look alike to the 'gringo.' but to one accustomed to the country, the nativity of the wearer can be ascertained as the hat of every State has its distinguishing feature. Entering the mine, each man, or pair of men when working double-handed, is set so many holes to drill of such depth and in such direction as ordered by the boss. The amount of meters to be drilled varies correspondingly with the hardness of the rock and other conditions. In hard rock, shaft work, wet places and hot raises, less work is expected than in the more favorable parts of the mine.

Day Shift at Fortuna Mine, San Fernando, Durango, Mexico.

In the States of Sonora, Sinaloa and Durango, at most of the mines with which the writer is familiar, the miner's pay is 1½ pesos (Mexican dollars) per shift of nine to ten hours. To earn this, he must drill from a meter to a meter and a half according to the nature of the rock, and he is allowed as much or as little time as he pleases to do his shift. If he is a good workman and does his work quickly, he is permitted to idle the balance of his shift; he is seldom allowed to do more than his allotted task, but should he fall short of what was set for him to drill, he will be docked accordingly. Drills, as fast as dulled, are exchanged for sharp ones with the tool-boy who makes frequent rounds through the workings for this purpose. The drills are checked out to the tool-boy at the shop and he in turn exchanges with the miners, drill for drill; by this method the loss of drills through carlessness is obviated. About half an hour before the end of the shift, the boss makes his rounds and measures up the work of the drillers and at the same time gives them the powder necessary for each hole. The miners charge and fire the blasts and, on coming to the surface, they turn into the shop their hammers and drills. Muckers are also put to task-work whenever practicable, and trammers are given a stated number of cars to run out, the number varying according to the distance. Their pay is generally one peso per shift, in fact, this is the standard pay on the West Coast for all unskilled labor in Mexico, whether on the surface or underground. Timbermen, as a rule, earn more than the miners, and while they are hired from day to day, yet owing to the uncertain nature of their work, they are seldom put on piece-work.

Under the *boleta* (ticket) system of paying the men at the expiration of the shift, the boss pays each man by means of checks or tokens made of celluloid or brass, of which he has several denominations calling for 25c., 50c. and one peso each. The men turn these into the mine office and the value called for is punched in the proper place on a ticket which is subdivided into squares corresponding to the days of the month; the men retain this, and should they care to make any purchase at the company's store, they can do so by presenting their ticket. The amount of their purchase is punched out and at the end of the month any credits remaining are paid in cash. On the first of every month each man is given a *boleta* with his name written on it. This system has proved efficient in mines where a large number of men are employed. In smaller mines, the *memoria* is more in use; this is nothing more than a daily report to the company's store, showing the men's earnings for the day, so that credit for that amount may be given them. Under either system the men live so closely to their earnings that very few of them have any money coming at the end of the month. Company stores are profitable, as they earn from 100 to 500%. Owing to the fact that the Mexican miner can seldom be depended upon to work steadily, for he comes and goes as he pleases, this method of regulating their time seems to be best.

The accompanying illustration is that of the day-shift at the San Fernando mines in Durango, and includes miners, muckers, trammers, ore sorters, water-boys and tool-carriers. The children in the front rank are also workers performing minor duties which come within the range of their capabilities.

Aluminum Solder.

A solder has been invented whereby aluminum is easily soldered. It was discovered that by combining tin, zinc and aluminum with chloride of sodium in certain proportions a new composition is formed which has many valuable properties. In making the compound these elements are fused together in the proportion of twelve parts tin, two parts zinc, and one part aluminum. One per cent chloride sodium is added to this alloy. By varying these proportions somewhat the composition formed by them may be made harder or softer according to the various uses to which it is to be put. Sometimes a small amount of metallic antimony is added which increases its hardness without materially changing the nature of the composition.

The alloy is pure white color, and is capable of receiving a high polish, which will not tarnish. It may be molded, welded, and worked in many ways. One of the valuable uses claimed for it is that it will adhere strongly to many metals, to glass, and to other substances without the use of flux and without any special preparation of the surfaces to which it is to be applied.

It may be applied by an ordinary soldering-iron, but the use of copper for this purpose is not necessary.

This composition is particularly adapted to soldering aluminum, as it adheres to it strongly and is as readily applied to it as it is to other substances, such as copper and tin. Bars and wires of aluminum and other substances, may be welded together by its use. Its high conductivity and the fact that it is not subject to electrolytic disturbances make it of value in soldering or welding electrical conductors of copper or aluminum or other suitable material.

AN INTERESTING OCCURRENCE OF GOLD is described by Mr. A. E. Kitson, of the Victorian Geological Survey, in a report on the Evans Reward mine. The rock is described as gray grano diorite (granite), and the gold is distributed among its decomposed and disintegrating constituents, particularly in a strip from two feet to three feet wide. It occurs in small heavy pellets or irregularly shaped specks. This strip is between two fault plains, and the feature of special interest is the presence of the gold without association in any way with vein quartz. It appears to have been deposited by percolating waters. The origin of the gold cannot, however, be settled until the workings get deeper and into undecomposed rock. It is probable that lower down sulphides of iron and copper occur with the gold in mechanical association.—Queensland Government *Mining Journal.*

FLUORSPAR.—The uses of fluorspar in foundry work and in steel making have largely increased the demand for this mineral, but notwithstanding the increased demand there have been no new deposits opened during the last year or two, and Illinois and Kentucky still continue to be the chief sources of supply of this mineral. The principal mines are near Rosiclaire, Elizabethtown and Cave-in-Rock, small towns on the Ohio river.

Sinking a Shaft Through Water-Bearing Material.

In sinking the Auburn shaft of the Robert Gage Coal Co., at Bay City, Michigan, there was much difficulty caused by soft, water-bearing material; finally, after two attempts at shaft-sinking in the ordinary way had failed, steel-sheet piling was successfully employed. The *Engineering News* gives the particulars:

The sinking was commenced March 10, 1904, and the shaft was made 9 by 16 ft. in the clear. After going through about 50 ft. of clay, a bed of sand and gravel was encountered, producing a very large amount of water. Work was continued for about four months, using a steel shoe which was forced through the sand by 40 jack-screws, but when this had been sunk about 30 ft. into the bed of sand (and was still about 15 ft. from the underlying rock) the surface caved in around the shaft, owing to the pumps having removed large quantities of sand with the water. As a result of this caving, the timbers were broken and the shaft was thrown out of line, so that the work was abandoned. Two other attempts were made in the same neighborhood, but these resulted in similar failures. Mr. Charles Coryell, the general manager, estimates that about $75,000 were lost in these three unsuccessful attempts to sink the shaft through the bed of water bearing sand and gravel. There were sometimes as many as seven 6-in. streams of water coming from the sand, and it was found impossible to prevent the sand from coming in with the water and causing large voids behind the timbering.

The use of steel-sheet piling was then suggested, the special feature of the plan being that the piles would be driven through the treacherous material to solid bottom and a complete caisson formed before any excavation of this material was begun. It was decided, therefore, to make another attempt and to use the Friestedt interlocking steel piling. The fourth shaft was then started, being sunk in the usual way through the 50 ft. of surface clay and about 10 ft. into the sand bed. At this point the use of the steel piling was commenced, and the piles were driven to a depth of 20 ft. Each 20-ft. pile was made up of two 5-ft. pieces and one 10-ft. piece, the short lengths being used in order to get the pile-driving machine under the braces in the head-frame of the shaft. The 5-ft. and 10-ft. sections of adjacent piles broke joint with one another, and the joints in each pile were spliced with plates bolted on, a band of copper being fitted between the ends of the sections.

The splicing took but little time and did not retard the driving of the piles. Some boulders were encountered, but were either broken or driven out of the way with little difficulty. At the bottom the piles penetrated 18 or 20 in. into the slate rock, making a tight joint. When all the piles had been driven, so as to form a complete caisson, the excavation of the sand was commenced, the shaft being timbered as the work progressed. The shaft was 7 by 14 ft. clear inside the timbering, and after reaching the rock it was sunk through that in the usual way.

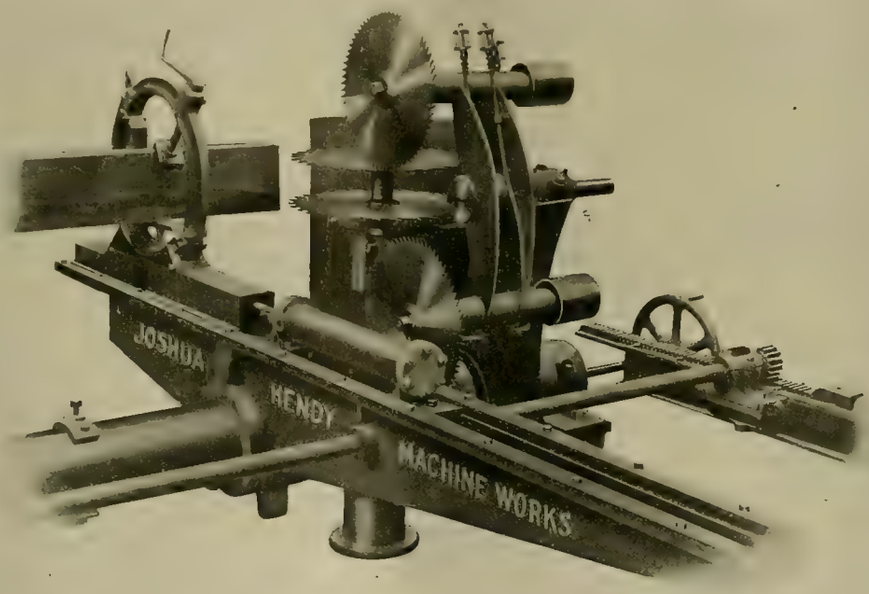
The method employed for driving the piles at the bottom of the excavated shaft is of special interest. At the surface and near the top of the shaft was a Star drilling machine, handling a 1,600-lb hammer by means of a jerk-line and giving it a drop of about three feet. The hammer was guided by a system of sheaves and guided directly over the piling by a large piece of pipe made of heavy sheet-steel. The use of a water jet to facilitate the work was tried at first, but this caused the sand to boil up in the shaft, and was abandoned. There was no trouble in driving the piles, but considerable time was consumed in changing the tackle to drive each piece.

It is estimated by an authority on copper that the largest individual consumer of copper in Europe is the German Electric Co., of Berlin, which uses about 18,000 tons annually, or about 40,000,000 lb. This is about the same amount with which the Westinghouse Co. is credited with consuming each year. The total visible supply of copper March 1, '06, was, according to Lewis & Sons, of Liverpool, 8,946 tons which is less than it had been for several years past.

An Improved Timber-Framing Machine.

The accompanying illustration shows a timber-framing machine of a type furnished to some of the largest mining companies of the West. The following description will make clear the construction and operation of this labor-saving machine, the purpose of which is to reduce the cost of framing either round or square timbers for mine use.

A heavy finished iron column forms the bed on which the various parts slide when it is desirable to change the length of the timbers. This column is held by cast-iron boxes and is prevented from turning by steel pins. The parts shown on the right are set and remain stationary except in changing the sizes of the tenon. Those on the left are connected by threaded rods and can be moved together by a screw inside the column, so as to shorten or lengthen the timber; they can be adjusted to suit the tenon desired and to line up the saws. The vertical saw-arbors are driven by quarter-turn belts from the counter-shaft and have a number of collars by which the saws can be set as desired. The horizontal arbors are mounted on a swinging frame, by adjusting which these saws are made to line up with those in front. The frame has also a side movement on its spindle, which is clamped by the cap-bolts. This change can be effected without altering the belt, as will be seen by tracing its course from the top of the driving-pulley to the upper-saw pulley, around the small pulley on the adjustable counter-shaft just behind the machine, to the lower-saw pulley and return to the driver.



A Timber-Framing Machine.

The various parts mounted on the column are prevented from turning by gibs, keys and set-screws, in addition to which the main frames are provided with jack-screws to stiffen them. The illustration shows the method of holding square timbers, but, by a quick change in the chuck-jaws, round timbers, also, from 8 to 18 in. diam., can be clamped. The chucks are made entirely of steel, and have teeth by which they are rotated 90° by an air-actuated rack and piston. The chuck and its cylinder are mounted on a slide, on the under side of which is a rack operated by a pinion on the long shaft that passes through the frames. This shaft can be rotated at will by means of the air-cylinder shown on the right.

With the saw in operation the timber is placed in the jaws, the chuck is closed and locked, the clamp-screws set down, and air is admitted to the large cylinder, causing the timber to pass through the saws. It is then returned, and air admitted to both small cylinders, causing the chucks to rotate 90°, when the second cut finishes the work. The valves controlling the admission and exhaust of air to and from the cylinders are placed in a position convenient to the operators. The question of lubrication of the rapidly revolving saw-arbors has been carefully worked out, each bearing having a sight-feed lubricator placed in plain view. All racks and pinions are steel and have cut teeth. Saw-guards are provided to cover the horizontal saws and end-gauge for setting the timbers.

The particular machine shown was made to work timbers from four to nine feet long between shoulders, 10 and 12 in. sq.; and round timbers from 8 to 18 in. diam., all of which sizes can be varied to suit the case.

The principal features of this machine have been thoroughly covered by patents secured by the Joshua Hendy Machine Works, San Francisco.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

Of the two samples from Lost Cabin, Wyo., one is limonite (iron oxide); the other, syenite.

The black heavy mineral from Leete, Nev., marked M. L., is magnetic iron oxide (magnetite).

Sample No. 1 from Douglas, Ariz., is gray copper. It also contains lead, zinc, and iron sulphide. No. 2 is micaceous hematite (specular iron ore).

The sample from Fortuna, Cal., is asbestos, of the kind that is usually ground for commercial uses, not having sufficient strength of fiber for weaving into asbestos cloth.

The mineral specimen from Cuyamaca, Cal., is tourmaline. The dike in which this mineral occurs should be developed with a view to ascertaining whether it contains gem stones of any description.

The sample from Gibbonsville, Idaho, marked T. M. O., is a metamorphic, semi-schistose rock, consisting mostly of quartz and fibrous hornblende. It is not a typical rock and cannot be distinguished by any particular name like granite, diorite, rhyolite, and similar specific terms.

Of the samples from Mayer, Ariz., marked J. C., the greenish rock is quartz, carrying chalcocite (copper glance), with malachite (green copper carbonate), as the result of the alteration of the glance. The dark colored rock is metamorphic—a tourmaline schist. There is considerable of this character of rock in Yavapai county.

Sample No. 1 from Kingman, Ariz., is volcanic ash, of no particular value. No. 2 is hematite. This may be from the gossan of a copper-bearing ledge, but this is difficult to determine. It is quite as likely to carry either gold or silver, and should be assayed for these metals. If copper be lower down in the vein, development will prove this later. It greatly resembles silver ore from the Silver King mine, at Calico, Cal., and also is similar to the gold ore of the Rose mine, east of Victorville, San Bernardino county, California.

A proper solution for removing scale and rust from iron would be one which removes the coating without attacking the underlying metal; but due to the fact that iron is attacked by all the known solutions more easily than the rather resisting scale, such a result is not likely to be attained. The action in pickling is due to the acid attacking the metal itself, and the scale is detached very largely because of the hydrogen formed, which quickly disengages it. The scale, when examined carefully, shows considerable porosity and cracks, which enable the acid to get in at many points; otherwise the disengaging of the scale would be very slow, and much metal would be consumed. Scale is either ferric oxide (Fe_2O_3), or ferro-ferric oxide (Fe_3O_4), the latter oxide, however, being the more important. A distinction may be made between two classes of baths: The dip, in which a practically concentrated acid is used, where it is desired to brighten the metal by the mere action upon the oxides, the concentrated acids not attacking the metal so readily; and the pickles, where diluted acids from about 3 to 20% in strength are used.

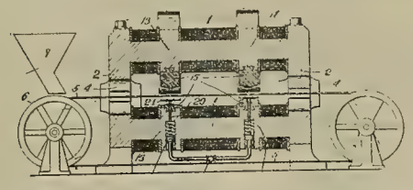
The Minerals of France.—The mineral production of France consists of lead, zinc, copper, coal and lignite, iron, antimony, arsenic and salt. An immense quantity of building stone and slate are quarried. The cement and phosphate production is large, aggregating sums far up in the millions of dollars. Coal is the chief mineral product. In 1904, 34,838,000 tons of coal and 634,000 tons of lignite were mined. The production of pig iron in 1904 amounted to 3,000,000 tons; wrought iron, 550,000 tons. The production of steel was as follows: Billets, 2,080,000 tons; rails, 246,000 tons; merchant steel, 937,000 tons; and plates, 299,000 tons. In 1903 there were 55 smelting works in activity, with 114 blast furnaces.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 27, 1906.

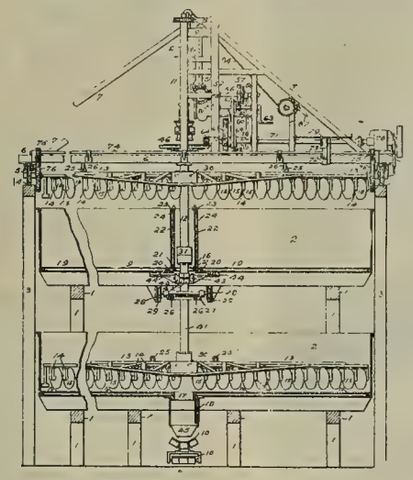
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MAGNETIC ORE SEPARATOR.—No. 816,491; R. R. Moffatt, Brooklyn, New York.



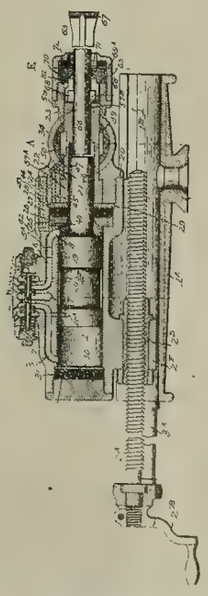
In magnetic ore separator, combination with a magnet comprising two sets of opposed poles producing two fields of different intensity, two cores each connecting one pole of one set in magnetic circuit with one pole of the other set, and side frames, having apertures, connecting the poles of the same set in magnetic circuit with each other, of a feed conveyer adapted to pass through the said apertures in the side frames, and two separating conveyers.

SYSTEM OF EXCAVATING AND FILLING VATS.—No. 816,065; H. W. Blaisdell, Los Angeles, California.



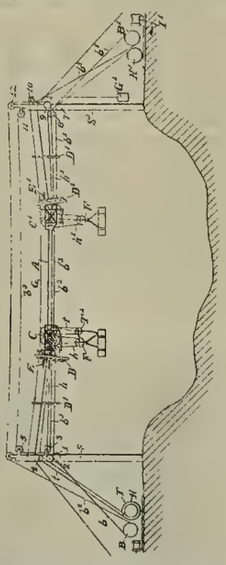
A system for discharging material from a plurality of rows of tiers of receptacles, provided with means for discharging material from the superimposed receptacle, a device constructed to receive the material discharged from superimposed receptacle and distribute the same uniformly within a subjoined receptacle and mechanism for alternately actuating means and for operating device.

DRILL-BIT-ROTATING MECHANISM FOR ROCK-DRILLING ENGINES.—No. 816,021; J. G. Leyner, Denver, Colorado.



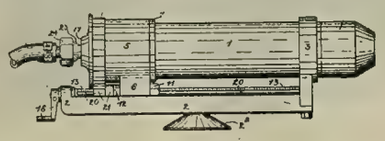
In a drill-bit rotating device for rock-drilling engines, suitable supporting casing, piston arranged to reciprocate in casing and containing an aperture, spring controlled pawls secured to piston in aperture, drill-bit holding chuck rotatably mounted in supporting casing and extending through the aperture in piston, ratchet teeth surrounding the periphery of drill-holding chuck and positioned thereon in operative relation to pawls, a rock-cutting drill-bit receiving aperture in drill-holding chuck, a drill-bit adapted to fit in chuck, means for attaching rock-cutting drill-bit to chuck and means for reciprocating piston and pawls to rotate step by step drill-holding chuck.

CONVEYING APPARATUS. — No. 815,963; C. H. Locher, Lemont, Illinois.



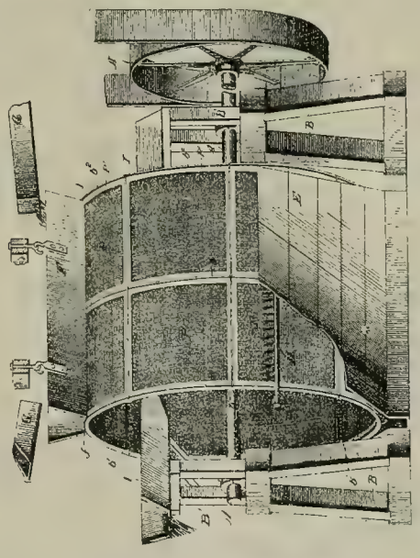
In cableway, in combination, single trackway, two carriages thereon, separate hoisting and traversing mechanisms for each carriage, hoisting-rope carrier for the hoisting rope of each of carriages and a single button-rope supporting the carriers of both hoisting-ropes.

ROCK-DRILL OR ROCK-DRILLING MACHINE. — No. 816,090; H. Hellman and L. C. Bayles, Johannesburg, Transvaal.



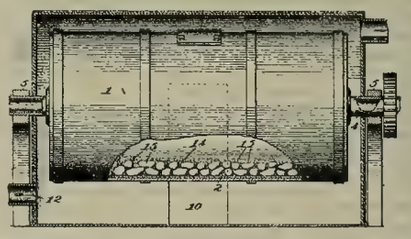
A rock-drilling machine or engine comprising in combination drill-cylinder carrying percussive apparatus, shell or cradle provided with forward guide in which cylinder is slidably mounted, a loose sleeve encircling cylinder constructed to slide in guideways formed in shell or cradle, feed-nut carried by sleeve, feed-screw stationarily carried by shell or cradle, and means for rotating the screw to traverse the sleeve and with it the cylinder longitudinally of the shell or cradle.

REVOLVING DRUM SCREEN —No. 816,426; J. P. Brew and E. P. Suiter, Basin, Montana.



A revolving screen comprising central shaft, a drum having peripheral covering of screen material and open ends, central supporting frame connecting shaft to drum and consisting of a central spider with radial arms rigidly attached to shaft and having adjustable spoke ends, an external hopper placed above the drum for feeding the material on the outer surface of the same and two reversely inclined discharge troughs arranged in the drum and extending from the center outwardly and downwardly through the open ends of the same and external supports for these discharge troughs.

PROCESS OF TREATING ORES.—No. 816,061; C. E. Baker and A. W. Burwell, Cleveland, Ohio.

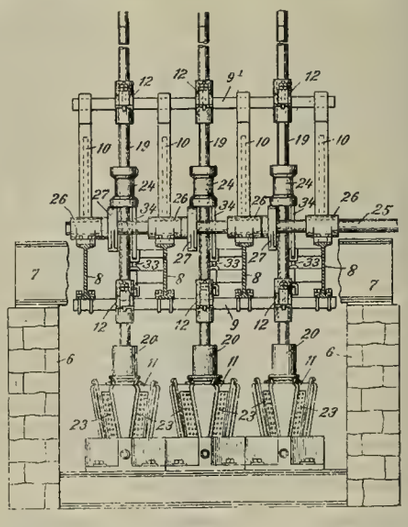


The process which consists in reacting with chlorine on a pulverulent ore containing metal or metals and a metalloid, producing the chloride of the metal or metals of the ore and recovering the metalloid in elemental state.

AMALGAMATOR.—No. 816,243; W. H. Morgan, Los Angeles, California.

An amalgamator comprising an inclined sluice box provided with an amalgamated surface and having depressions forming riffles sunk in the bottom and spaced apart and charged with mercury; the upper walls of riffles respectively being overhanging and deeper than the lower walls, and a screen arranged to shield the amalgamated surface.

STAMP-MILL.—No. 815,936; M. P. Boss, San Francisco, California.



In stamp-mill, the combination of longitudinal girder, supporting pillars therefor, situated entirely independent of the mortar boxes of mill, a series of parallel sills connected at one end to girder, means for supporting the opposite end of sills, guide girths connecting sills, guides on guide girths, series of mortar boxes arranged in a line, series of stamps movable in guides, and means mounted on sills for reciprocating the stamps.

Special Correspondence.

LONDON, March 28.

The Spassky Copper Mine, Ltd., was formed in 1904 with a nominal capital of £300,000 in £1 shares, of which 250,000 are issued, and £102,400 of 5% debentures. There is a board in Paris, as well as one in London. The property, which was purchased for £200,000 in fully paid shares and £100,000 in cash, comprises the Spassky smelting works and copper mines, the Yuspenssky copper mines and the Karagandy coal mines, all in the Akmolinsk district, Siberia. The nearest station on the Siberian railway is Petropawlowsk, 500 miles distant along a post road, yet the cost of freight on copper from the mine to the railway is only about £5 per ton, the sleighs in winter and carriages in summer traveling at the rate of 100 miles per day. At the first annual meeting last week the chairman, Mr. Arthur Fell, stated that the district yielded iron, fireclay and other minerals, and that plentiful supplies of wheat, meat, etc., can be obtained at extraordinarily cheap prices. A report on the Yuspenssky mine has been received from Mr. E. T. McCarthy. From this it appears that the mine, as opened up by the former owners and dealt with by the company, consists of two shoots, one known as the Vladimir and the other as the Annensky; the two shoots are believed to join. When the company originally took the property over, the Annensky shaft was down 258 to 280 ft.; this shaft was sunk to the 350-ft. level, and the drift from the shaft to the orebody was extended. For the first 36 in. it ran 40% copper; then it went through 20 ft. of 20% ore, and then 51 ft. further still ore that assayed copper, and faded down to 1% at the extreme further 8% side. This body of ore has now been opened up to a large extent, and from it, above that level, Mr. McCarthy estimates the company should extract 38,000 tons, beside sundry small amounts which are in the level above. That, the chairman pointed out, is in the Annensky. The Vladimir shoot is only 200 ft. off; according to Mr. McCarthy's report, this contains 21,000 tons of ore, as far as opened up. He also estimates that the ore-shoot may reasonably be held to continue 100 ft. below, because at the bottom there is a splendid floor, part of it almost half copper, and the other part about a quarter copper. He expects this will go down another 100 ft. and estimates a further 116,000 tons. The amount of copper in the 100 ft. and in the 75 ft. down to this drift amounts to 13,000 tons in one part and 24,000 tons in the other, and the value of this copper he puts at £3,374,000, that is, taking copper at the price of £90 per long ton. The chairman said that at the present price of copper, the figures of Mr. McCarthy would have to be increased by £749,000, which would make the total amount £4,125,000; in addition to the ore already proved, he says we may believe that the enrichment, through leaching, will continue down to 600 ft., and then the workings will get into the normal condition of this ore, which, although not so rich, must pay handsomely.

Other deposits are referred to in Mr. McCarthy's report — as shown by the old workings — which cannot at present be valued, and there are also outcrops on other parts of the property, impregnated throughout with blue and green carbonates. The smelting works are at Spassky, 72 miles distant from the Yuspenssky mine. These works were originally placed there by the former owners for two reasons: (1) Because there was a good water supply, and (2) because there were large copper mines actually within 100 yards of the works. The report states that there are 25 claims or mines round the Spassky smelting works, but it is impossible for the company to undertake the opening up, prospecting and deepening of these other mines while they have so much work in hand. That will have to be left for the future and, possibly, to subsidiary companies.

At the coal property, 20 miles from the smelting works, the manager has reported the cutting of two seams, one 60 in. and the other 55 in. thick. This coal has been in use, and by it all the copper produced by the company during the last 18 months has been smelted. Up to the present the output of copper has been limited to 100 tons per month from the old works, but the modern plant is now being erected to produce 300 tons per month or more. For the period covered by the first accounts—15 months—the profit, using the old works, amounted to £33,000. After writing off preliminary expenses, cost of the debenture issue and development work, there is a carry forward of £17,000. A cool observer is bound to assume that it is only in anticipation of the good things to come that the £1 shares have been talked up to £7 15s. in the market.

A still newer claimant for favor is the Phillips River Gold & Copper Co., Ltd., started in January last with a capital of £100,000 in shares of £1 each. The property is in Western Australia. According to the information given at the statutory meeting, the amounts called up have provided £37,500, out of which some £26,700 has been remitted to Australia for the purchase of leases and options, and for working expenses; £720 has been paid in London for the formation expenses, etc., and there is £10,080 cash on hand. The chairman pointed out that no intermediate profits have been made on the purchase of any of the properties and options; and that no bonus shares have been issued or provided for, nor has any money been paid, nor is there any money to be paid, for underwriting. Some three years ago the possibilities of the Phillips River district attracted attention, and the discoveries made by prospectors were carefully watched by the directors and their agents in Western Australia. Toward the latter part of last year the field had been so well prospected and the developments so promising that in September options were secured on eleven leases. Mr. Fred Morgan was then appointed manager and commissioned to make a more thorough examination. Options on five of the leases were abandoned, three leases were purchased, and the options on three others are still running. The total area purchased and under option is 247 acres. Recent developments confirm the manager's previous report and the favorable opinion of Mr. Montgomery, the Western Australian State mining engineer. Mr. Charles Kaufman, the chairman, in concluding his speech, said that in the whole of his long experience in mining, after three years carefully watching the developments and the advantages of the Phillips River district and the more recent developments on the company's properties, it was his opinion that the company possesses the possibilities of great mines.

The prospectus has been advertised of New Junction Deep Leads, Ltd., capital £80,000, in shares of 5s. each. Two of the directors are on the boards of other deep leads in the same district. The company has been formed under the auspices of the West Australian Goldfields, Ltd., to acquire the whole of the undertakings of the Junction Deep Leads of Victoria, Ltd. The property to be acquired adjoins the Charlotte Plains Consolidated Gold Mines, Ltd., and the Victorian Deep Leads, Ltd. The Charlotte Plains company has now unwatered its property sufficiently to enable trial washings of the gravel to be made, with satisfactory results, while at the Victorian Deep Leads the pressure of water is decreasing; consequently, it is believed by local advisers and engineers that these pumping operations will have had a considerable effect in reducing the pressure of water that will be encountered on the Junction property. The main drift or tunnel is now in a distance of 700 ft., and it is estimated that an additional 600 ft. will bring it under the wash dirt.

Near the junction of the two gold-bearing leads, and on the property to be acquired, a shaft has been sunk to a depth of 325 ft., at the bottom of which a pump-chamber has been cut into solid rock, 45 ft. long, 25 ft. wide and 20 ft. high, which contains a three-throw plunger pump with a capacity of 2,500,000 gal. a day. This pump will be driven by a 250-h.p. electric motor, the power being supplied by the Deep Leads Electric Transmission Co. This power company has a capital of £45,000 (all of which is invested in plant). Its central station is believed to be one of the finest in Australia.

According to the latest cabled news from the Charlotte Plains, the result of treating 189 fm., taken from the drifts put in to drain the wash dirt, was 119 oz. 6 dwt. of gold; a patch of black sand has been struck, which assays up to 30 oz. per fathom.

The estimated profit of Esperanza (Mexico) reported for the month of February is $378,919, an increase on January, but not up to December amount. The market has shown disappointment in the rate of the dividend declared for the quarter to March 31 — six pence per share, with an addition of 5s. per share, instead of the extra 10s. paid for December quarter. After falling to £3 15s. the shares have recovered to £4, but anxious enquirers on this side fail to elicit the cause of the lower dividend.

Camp Bird must be considered to have beaten the record for a rapid succession of lurid catastrophes—first the snowslide, then the devouring fire. The market has begun to recover from the shock, helped by the assumption that there is nothing to prevent development at the mine being continued, for which and the reconstruction of the mill, etc., ample funds are available. Meantime dealers and speculators have had the chance of a turn in the shares.

JOHANNESBURG, March 12.

Like a thermometer, the Rand has its ups and downs. For a while we were on the mountain tops, for it seemed as if the chief difficulty, that of labor, had been solved. Now we are down in the valleys. There is a bigger outbreak of 'dumps' on the Rand today than has existed for years. Not that the pay of the wage-earner has been reduced, or that cost of living has suddenly doubled. The condition of the employed is, for the present, quite satisfactory. It is the outlook on the future and the number of unemployed in our midst which gives most people the 'blues.'

The Rand Aid Association has issued a circular, a report of which in the press is headed, "Don't come here!" The number of men of all trades and professions, who have applied to the organization for work, has greatly increased during the past month. Many artisans have been employed in the construction of large buildings in Johannesburg. The Carlton Hotel (the finest hotel in South Africa) is now finished, as are the Cullenan Buildings, the Johannesburg Consolidated Investment Buildings, etc. As there are no new buildings going up, these skilled artisans are now out of employment. Commercial houses have found it necessary to curtail expenses and have dismissed many clerks. The neighboring colonies seem to consider the Rand a Mecca, and many workers from other parts of Africa have come to Johannesburg. The number of 'wasters' in the ranks of the unemployed is large. These men make off to the nearest bar with their first pay. But unfortunately there is a number of capable, respectable men, only too eager to work, who cannot find employment. The demand for relief has considerably increased. And yet there is a paradox in this question of unemployed. While the press has been pointing out how many idle men there are in our midst, quite a discussion has gone on over the scarcity of really skilled miners on the Rand. It is highly improbable that there are many first-class miners, with local experience, in the ranks of the unemployed today. The only real demand seems to be for skilled miners and rock-drill men. Of course, there are hundreds of so-called miners looking for work.

Much the same state of affairs prevailing today was noted in 1897. The explanation is simple. The Transvaal has actually one industry. If men are discharged from mines, there is practically no other sphere for them to enter. Curtailment of expenses on a few properties, and the closing down of a mine or two, soon creates a problem of the unemployed. So th Africa's power for absorbing white labor is extremely limited. While realizing the futility of making this a 'white man's country,' like Australia, one cannot help sympathizing with those enthusiasts who have tried to increase the opening for white labor, by advocating it for the rough work now done by Chinese. The explanation for the depression is not to be found in the collapse of the Rand. Potentially the Rand is as great as ever. Recent exploratory work has enormously extended the horizons. The trouble is almost solely political. Provided the political difficulties can be overcome, and an ample supply of unskilled laborers is provided, the Rand will leap forward once more. But the Liberal party in England has upset all the arrangements made for the supply of unskilled labor from China. Nobody knows exactly where we stand, or what is going to happen. Expansion at the present moment, with so much uncertainty, is out of the question.

SALT LAKE CITY, April 9.

Ground has actually been broken for the new concentrating mill to go up near the townsite of Garfield, under the direction of the management of the Boston Consolidated Mining Co. Contracts for the structural material and equipment for the mill and power-house will soon follow. There will be a great deal of interest attached to the building of this plant, and that of the Utah Copper Co. near by, as millmen and metallurgists will have excellent opportunity to observe what stamps will do in ore crushing as compared with rolls and Chilean mills. Identical ores are to be treated; but the metallurgists of the respective companies differed as to methods. The staff of Samuel Newhouse, for the Boston Consolidated, decided in favor of stamps, and the Utah Copper's management is an adherent of the roll and Chilean mill. The result will be watched with interest, and doubtless a gain in knowledge.

The board of directors of the Jefferson Consolidated Mining Co. has commenced suit against the former president of the company to compel him to return to the treasury of the company 50,000 shares, in accordance with a certain agreement alleged to be in existence. Schmittroth owns 240,000 shares and the court is asked to restrain him from disposing of any portion of it until the case is settled. The company owns property near the mouth of Little Cottonwood cañon.

The mill at the Overland gold mine at Sunshine, Tooele county, will be started in about 60 days. It has reserve-bin capacity of 150 tons and tank capacity of 2,000 tons. For nearly a year the company has directed its energies toward sinking a new vertical working shaft, the old incline having caved and left it unfit for further use. The new shaft is down over 900 ft., entering the orebody at 860 ft. The ore at this depth carries values slightly better than was disclosed in the workings nearer the surface. The average is close to $3.50 in gold. E. W. Clark, Ophir, Utah, is manager.

The Columbus Extension Mining Co. has been organized to operate the Jacobson group of lode claims at Alta. The stock has all been subscribed. The company will start off with about $200,000 available for development and equipment. The property adjoins that of the Columbus Consolidated and Consolidated Flagstaff companies. A. Jacobson is president; A. O. Jacobson, vice-president; S. A. Whitney, secretary and treasurer, all of Salt Lake City.

There has again been delay in starting the new Godiva mill at Eureka, owing to the failure of certain parts of the equipment to arrive, which is now being installed. The plant will be running, however, before the close of the month.

Increasing interest is being taken in development work in the north Tintic district, near Eureka. The Selma group has been incorporated. The officers and directors are: Lars C. Peterson, Judge Thomas Marioneaux, of Salt Lake; Dr. A. L. Castleman, Bingham; E. K. Olson M. E., and Culbert Olson, of Salt Lake City.

Better results are being obtained from the operation of the concentrating mill of the Newhouse Mines & Smelters corporation, which is situated in Beaver county. The ores of the Cactus mine are treated at this plant and the record for the last week in March showed an average of a little more than 12% copper in the concentrate produced, whereas, about the beginning of the year, the returns were 8 to 9%. President Newhouse says about 75 lb. of concentrate are being shipped daily, representing the returns from 700 tons of ore treated. Within a few weeks the mill will treat 1,000 tons daily. It will probably be two months yet before the work of stripping the two acres of surface is completed and the commencement of mining by steam shovel begins, when the bulk of the ore going to the mill will come from this source, when, according to Mr. Newhouse, the cost of mining will be reduced from $1.50 to 40c. per ton. Economic methods have resulted in reducing the milling costs from 75c. to about 47c. per ton and the management expects to bring it down to 35c. The mill is saving about 85% of the values.

Engineers in the employ of the American Smelting & Refining Co. are making an examination of the Mammoth mine in Tintic district.

The directors of the Uncle Sam Consolidated Mining Co. have declared a dividend for April of $5,000.

With 80 acres of ground, adjoining the Albion mine at Alta, the Secret Mining Co. has been organized and will begin development. The officers are: W. M. Minor, New York, president; Charles P. Minor, Kansas City, vice-president; H. S. Harper, Salt Lake, City secretary.

An order was placed during the week for 18 Chilean mills to do service in the new mill of the Utah Copper Co. at Garfield. Another order covering the steel structural material, to weigh about 2,000 tons, for the second unit has been let to the Minneapolis Steel & Machinery Co. Excavations for the second unit are being made and are to be finished and foundations in by August 1.

It is expected that the announcement will soon be made officially that F. Augustus Heinze and associates are in control of the Bingham Consolidated Mining & Smelting company.

Developments at the Daly Judge mine at Park City are growing more important daily. A large orebody has been opened on the 1500-ft. level. Driving both ways on the shoot is in progress and it has been opened for over 200 ft. The width has not yet been ascertained, but is known to be at least 10 feet.

High-grade ore struck on the 700-ft. level of the New York Bonanza mine, at Park City, has created new interest in that property. The ore is about three feet wide.

Eastern parties are having the Utahna mine, in the Errickson district, examined with a view to purchase.

Development at the Kennebec mine, in the Big Cot-

tonwood district, has been resumed. A contract to drive the intermediate tunnel 300 ft. further has been let.

Sinking below the 900-ft. level of the Scottish Chief mine, near Park City, is about to begin.

Recent rains in the south practically destroyed about 15 miles of the 40-mile road built last year by the Utah & Eastern Copper Co. The road runs between the mine and smelter and Acoma, a station on the main line of the San Pedro, Los Angeles & Salt Lake railroad.

The owners of the Jenny and Utahna mines at Fay, Nev., have decided to put in a 30-ton mill. Charles A. Short, of Fay, is manager.

The Southport Mining Co. has been organized to work at Stockton, where 100 acres, adjoining the Honerine and Cyclone properties, form the basis of operations. The incorporators and officers are the following: J. R. Rand, of the Ingersoll-Rand Drill Co., New York, president; W. C. Alexander, manager of the Black Diamond Mining Co., Salt Lake, vice-president; L. H. Farnsworth, cashier Walker Bros.' bank, Salt Lake, secretary and treasurer, who, with Charles H. Scheu, of Salt Lake, and William E. Beach, Lafayette, Indiana, are directors.

What appears to be the most important strike of ore ever made in the Eagle & Blue Bell mine of Tintic has been made on the 1,000-ft. level of that property. Nothing official as to the extent of the find has been given out.

The total shipments from Park City mines last week amounted to 4,094,860 pounds, the shippers and amounts being: Silver King, 1,617,860; Daly West, 1,400,000; Little Bell, 115,000; Daly-Judge, 773,000; Daly-Judge (zinc middlings), 194,000.

The ore and bullion settlements reported by Salt Lake banks last week aggregated $407,800.

Ore shipments from the Tintic mining district last week aggregated 153 carloads, the shippers and amounts being: Ajax, 2; Black Jack, 1; Beck Tunnel, 3; Bullion Beck, 11; Centennial Eureka, 50; Dragon Iron, 2; Carisa, 1; Eagle & Blue Bell, 6; Eureka Hill, 6; Gemini, 22; Grand Central, 8; Joe Bowers, 1; Lo. Mammoth, 5; Mammoth, 15; May Day, 4; Ridge & Valley, 4; Swansea, 2; United Sunbeam, 1; Uncle Sam, 2; Victoria, 6.

BUTTE, April 7.

The March copper output of the Butte district amounted to 29,347,080 lb. The intensely cold weather which continued for two weeks was responsible for a shortage of 3,000,000 to 4,000,000 lb., as many of the mines were handicapped and a number of them had to suspend operations altogether for several days. Except for several days, the Gagnon mines of the Amalgamated Co. hoisted no ore throughout the month. The daily output of ore in tons, the yield per ton in copper, and the total daily yield of pounds in copper are shown in the following table:

Company.	Tons of ore.	Pounds per ton.	Total lb. daily.
Boston & Montana Co.	3,550	68	241,400
Anaconda	3,300	68	224,400
Butte & Boston	500	60	30,000
Washoe	460	63	28,980
Parrot	550	68	37,400
North Butte	1,100	120	132,000
Butte Coalition	1,600	70	112,000
Clark's Original	800	80	64,000
Pittsburg	200	80	16,000
East Butte lessees	200	100	20,000
Raven	50	110	5 500
Miscellaneous	500	70	35,000
Total	12 810	...	946,680

The following table shows the total ore tonnage and total copper output in pounds:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	110,050	7,483,400
Anaconda	102,300	6,956,400
Butte & Boston	15,500	930,000
Washoe	14,260	898,380
Parrot	17,050	1,159,400
North Butte	34,100	4,092,000
Butte Coalition	49,600	3,472,000
Clark's Original	24,800	1,984,000
Pittsburg	6,200	496,000
East Butte lessees	6,200	620,000
Raven	1,550	170,500
Miscellaneous	15,500	1,085,000
Total	397,110	29,347,080

The stockholders of the old Butte Mining & Development Co., of whom there is a very large number, will be interested in the announcement that the Butte Copper & Zinc Co., which has purchased the Emma mine on which the former company had a lease and option, is about to resume operations on that property and will build a plant at the mine for the reduction of the large deposits of zinciferous ore, for both zinc and silver. The new company will use the new process which is employed by the Montana Zinc Co., said to be the only process that has been found to successfully treat the Butte ores of that character. The Butte Mining & Development Co. spent about $200,000 in sinking the Emma shaft to a depth of 800 ft. and in crosscutting. Because there was too much zinc in the ore—zinc then being regarded as a detriment and smelters charging a large penalty for treating such ore—the company abandoned the property and relinquished the option. Dr. Maurice Eisenberg secured an extension of the option through the old company and then interested new capital in it, and after devoting three years to it succeeded in reorganizing under the name of the Butte Copper & Zinc Co. Clarence B. Wisner, of New York, owner of the new zinc smelting process, is interested with Dr. Eisenberg. The stockholders of the Butte Mining & Development Co. were given a chance to come into the new company, but only a few took advantage of it. The new company is capitalized as the old one was, for $2,500,000. The company has ordered machinery for an electric smelting and hoisting plant at the Emma and announce that within six months it will be hoisting and treating the Emma ore. The shaft is to be sunk to a depth of 1,600 ft., at which depth it is thought the copper zone will be struck. The company has also acquired several adjoining claims, one of which in past years was worked extensively for silver and was in good ore when further work was made unprofitable by the low price of silver. The plans of the company include the unwatering of the shaft and 2,000 ft. of underground workings; drifting on the orebodies on the 400, 500 and 800-ft. levels, to place the mine in condition to produce about 300 tons of ore per day; sinking the shaft to a depth of 1,600 ft. and crosscutting to the vein at the 1,200 and 1,600. The promoters of the company believe that the zinc will practically disappear at a depth of 1,200 ft., but so far as its zinc smelter will be concerned there will never be a lack of ore in the Butte district, because there is a zinc capping of 500 to 1,000 ft. nearly all over the district, and while heretofore the zinc contents of the ore has been a detriment and a loss and extra expense in the treatment of the ores, it will now become a valuable asset. Mr. Wisner and his associates have for several years experimented with the process and have demonstrated its success by working the ores of the Alice and Lexington mines. For a year a little experimental plant at the Alice mine has been handling about 100 tons a day, part of which came from the Lexington.

The Raven has driven 30 ft. east on the north vein of the Snoozer, from the crosscut on the 1,500-ft. level, and crosscut into the hanging wall, showing the vein at that point to be 20 ft. wide. The ore through the entire width of the vein is good shipping ore. In the distance of 30 ft. the vein has widened from 12 to 20 ft. On the 1,200-ft. level the east raise is also in ore, four feet wide and running about 12% copper. This raise is 600 ft. east of the crosscut. Another raise from the east drift is in good ore, and so are two raises from the west drift. Drifting is still in progress on the south vein of the 1,200 level, and there are now 300 ft. between the two faces of the drifts of ore two to six feet wide. It is all good shipping ore that yields four to six per cent copper and carries silver.

The Butte & St. Louis Mining Co. has commenced to operate on a small scale at the Kessler property in North Walkerville. A hoisting plant is being installed, and sinking on the shaft from the present depth of 100 ft. to to the 300 level will shortly be commenced. The property is under the management of S. M. Roberts, while active operations will be under the direction of Thomas R. Davey. The Kessler some years ago produced large quantities of pay ore, which was mined from the 150 level of the old shaft. Connections from the old to the new shaft have been made, and in addition to sinking the new shaft deeper the company expects to mine ore at once from the old workings. There is a good showing in the mine at the 100-ft. level, a stope 90 ft. long being blocked out. The ledge extends the full length of the Kessler claim.

The Butte Copper Belt Mining Co., capitalized for $7,500,000, has been organized in Butte for the purpose of prospecting and developing an extensive tract of mineral land east of Butte on the continental divide. The company controls about 200 acres, undeveloped. The plan of the new company is to sink three shafts and thoroughly explore it. The officers of the company are James A. Talbott, president; Samuel H. Treloar, vice-president; J. R. E. Sievers, treasurer; Russell P. Howard, secretary; A. J. Poser, manager.

The Anaconda Co. has started to sink the shaft of the High Ore mine 600 ft. deeper. It is now down to 2,200 ft., and is one of the deepest shafts in the district. The High Ore shaft and workings of that mine have been so constructed as to act as a drain for nearly all of the hill mines of the amalgamated company. Steel structural work for an electric plant is also being put up at the High Ore. The plant will receive its power from the Missouri river, about 75 miles from Butte.

F. A. Heinze, who recently returned to Butte from New York, says he will devote his time to mining in Montana and elsewhere in the West, notwithstanding the fact that he sold all of his United Copper interests to the Butte Coalition company, and that in a short time he will be employing as many men as he did before.

TORONTO, April 7.

The Ontario Government this week announced an entirely new departure in connection with its mining policy. As previously intimated, a question of much interest has been the disposal of the particular tract of valuable mineral land lying south of the Cobalt mining area, known as the Gillies timber limit, which has been closed to prospectors in order to allow of the removal of the timber. The situation is peculiar, owing to the known existence of valuable deposits, all claims for priority of discovery being doubtful and confusing. On April 3 Premier Whitney announced in the Legislature that the Government, after considering all the circumstances, had arrived at the conclusion not to dispose of it at all, but to retain title and develop and mine it for the benefit of the people of the Province. As soon as the time set for the removal of the timber expires, which will be on October 1, the limit will be placed in the hands of a commission to operate for the public revenue.

The limit in all embraces about 100 sq. mi., of which the extreme northern portion (which projects into the Cobalt mining area to within half a mile of the town and has an area of some 3½ sq. mi.), is known to be very rich in silver-cobalt ore. In places solid masses several pounds in weight of almost pure silver have been found on the surface and much of it has been carried off. At present it is guarded by a strong force of constables. It is not positively known whether the remainder of the limit has any valuable deposits or not, though it is reported to show indications of mineral wealth. The Government has instructed W. G. Miller, provincial geologist, to make a thorough examination this season of the portion of the limit near Cobalt and ascertain the geological formation and the course of the veins, for the guidance of the Commission in the course of the development. At a later date he will make an exploration of the other portion of the tract.

A general inspection of mining locations in the Temiskaming district will be made as soon as the season permits, by A. H. A. Robinson, recently appointed mining inspector, which may result in throwing open many of the locations lately made. Many claims are held by prospectors, who have staked out locations during the winter when it was practically impossible to make discoveries of mineral, and in such cases their claims will be disallowed.

Mining Summary.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ARIZONA.

Gila County.

(Special Correspondence.)—Ore hauling from the mines at Globe, which was interrupted for a few days this and last week by the heavy rainfall, has been resumed, although the roads in places are still soft. Two outfits are reported bogged, one on Miami flat and the other some distance west of that point. There are now more teams hauling ore to the Old Dominion smelter than at any time heretofore. Forty teams are hauling from the Live Oak mine, the Gibson Mining Co. has 17 teams, and there are 8 or 10 hauling from the Black Warrior, Geneva, and other mines. The Old Dominion is now in much better shape than it has been at any time since the fire in the Interloper shaft, on February 20. Nearly the full complement of men is at work in the mine and all the levels have been opened. Shaft work is progressing rapidly, and the winze sunk from the tunnel in the lime quarry will be completed to the third level within a few days, which is expected to create a strong down draught and to improve ventilation. The C shaft has reached a depth of 80 ft. and is going down four or five feet daily. At the smelter three furnaces have been running most of the time and the production of copper for the current month will be 2,750,000 lb. The new furnace will be completed by the end of the week.

Globe, April 8.

Mohave County.

(Special Correspondence).—The shaft of the West Gold Roads Co. is down 350 ft. and will be continued to 500 ft., where a crosscut will be run in expectation of reaching the pay-shoot of the Gold Roads mine, which is but 300 ft. away. There is much activity throughout the district. The postoffice for Gold Roads section is now officially known as Gold Roads, not Acme, as formerly.

Gold Roads, April 8.

(Special Correspondence.)—A report has reached Kingman to the effect that a discovery of rich placer ground has been made in the Cedar basin country, to the north of Rioville. The gravel is said to be extensive and the gold coarse. Many people are rushing in there. The Cedar basin is on the east side of the Virgin range, north of the Colorado river. Last year some good veins were discovered and worked. The ore was found to be gold-bearing, oxidized iron. Harry Gentry, of St. Thomas, and M. Redman, of Kingman, were interested in mines in that section. Mr. Gentry at one time had his properties under bond, but the parties failed to take the option, owing to the lack of water and its isolation. The veins showed a good grade of ore, which is easily worked. Now that placer gold has been found there, means will probably be found to work them.

Arrangements are being made for the purchase and erection of a concentration mill on its Vanderbilt mine at Cerbat by the Cerbat Mountain Mining Co., of which John Boyle is general manager. The mill will have a capacity of 25 tons per day. The ore now being taken from the lower level will be shipped to the smelter. Ore from the upper levels will be milled, the concentrate calcined and amalgamated. In this way a saving will be made in freight charges. The mine is proving one of the best properties in the district.

Thomas E. Ludlam, of Sea Isle City, New Jersey, who arrived in Kingman recently, has gone to the Mocking Bird mine in Minnesota district, of which he is general manager. The Mocking Bird, under recent development, has exposed six feet of ore which assays more than $300 gold per ton. A force of men has been developing water the past two months, with success. Two carloads of ore are to be shipped to the smelter and milling tests are to be made.

Kingman, April 9.

It is reported from southwestern Utah, one of the wildest spots in the West, that placer fields have been discovered in what is known as Cedar basin. The mines are north of Iceberg cañon, one of the tributary cañons of the Colorado, and on the east side of Virgin mountains. Last summer rich veins of gold were found there, but lack of water made it impossible to work them. The placers are reported to be rich in coarse gold and the field extensive. A rush from St. George, Utah, and the Muddy valley, in Nevada, is now on, and many people are outfitting and will go into this latest Eldorado.

Yavapai County.

(Special Correspondence.)—The mill on the properties of the Arizona Gold Lodes Co. is running steadily on ore from the mine in Cherry creek district. The main working shaft is down over 200 ft. and in good ore.

Briggs, April 8.

CALIFORNIA.

Butte County.

In the development of the Sunset mine, in Nimshew district, two miles north of Nimshew, a copper-bearing ledge 50 ft. wide has been cut, some of the ore being high grade. The mine is owned by M. C. Torrison, who became interested in the Indian Springs gravel mine some years ago, and spent considerable money in an endeavor to re-discover the channel, which had been lost by former workers. The Indian Springs was at one time one of the biggest gold producers on the Nimshew ridge. There are two or three miles of underground development on the property.

Calaveras County.

Frank Bernardi, of Mokelumne Hill, has bonded the Deep Gulch, Gold Standard and Steep Gulch mines for two and a half years for $50,000. The mines are just north of town, in a district which has not been worked to any great extent. Eastern capital is interested and work will commence May 1, when 15 men will be employed.——Work on the Nuner tunnel is making good

progress, with a full force of three shifts of eight hours each.——Work on the Ariel mine has been started up by Frank Cortmarsh.——The repairing and retimbering of the tunnel at the North Star is progressing. Other mines in the district will resume as soon as the weather appears to be settled.

Inyo County.

A smelter is being built near Keeler to treat the ores of the Cerro Gordo mines, which were extensively operated in the later 70s. At that time a smelter was in blast at Cerro Gordo, but the old works were dismantled years ago. During the 80s some sorted ore was shipped from Cerro Gordo to Selby's, but of late years there has been little activity in the old lead camp.

Nevada County.

The annual report of the North Star Mines Co., of Grass Valley, shows that during the year 1905 the total output of ore was 77,530 tons, yielding $11.30 per ton, costing $4.92 per ton for operation and $1.30 per ton for development work; a total of $6.22 per ton, leaving a profit of $5.08 per ton. This is without allowance for improvement outlays, which amounted in 1905 to about $1.28 per ton of ore. The total value of the ore produced was $876,361.31, at a current operating cost of $381,313.73 and an operating profit of $495,047.58. During the same period sums amounting to $207,750.19 were expended on other accounts, mainly for development and improvement.

Shasta County.

(Special Correspondence).—The managing director of the Mammoth Copper Mining Co., A. F. Holden, has completed an inspection of mine and smelter, and is so well satisfied with the results already obtained that he has decided to install two more blast furnaces, making a total of five; also, mechanical roasters and a reverberatory furnace to treat the fines and flue-dust. The company's smelter superintendent, R. D. Rhodes, is at Salt Lake City, and may remain there completing alterations at the U. S. smelter. Jas. Kerwin is filling Mr. Rhodes' place, with W. S. Keith as his assistant.

The Balaklala Copper Mining Co. is preparing for the erection of its matting plant just below Kennett, on the Sacramento river, the product of which will be shipped to the American Smelting & Refining Co.'s proposed smelting works at San Bruno, on San Francisco bay.

Kennett, April 9.

Tuolumne County.

(Special Correspondence).—Operations will be resumed at the Carlotta-Pennsylvania, one mile north of Tuolumne, about April 15. It is the intention to sink the two shafts, each at present 200 ft. deep, to a depth of 600 ft., connect them at this level and run crosscuts to intersect the six veins running parallel through the properties before milling ore. J. T. Thompson, the general manager, who has been in the East for some time, is here making necessary preparations. The mill will be increased from 7 to 15 stamps when the development work outlined has been completed. The shaft on the Carlotta is not on the same vein as that of the Pennsylvania, as these are about 500 ft. apart. These veins have an average width of 20 in. The last 100 tons of ore milled from the Carlotta went $19 per ton free gold. Numerous assays from the bottom of the Pennsylvania shaft showed $76 to $3,218 per ton, and a mill test of 600 lb. of ore from the same place gave $130.——A 10-stamp mill will shortly be erected at the New Calico mine, on the Mother Lode.——The Porto Fino mine, near Tuolumne, is being put in condition to enable Eastern people to inspect it. This property is near the Carlotta and Pennsylvania.——The new superintendent at the North Star has arrived and work will begin at once.

It is reported that the owners of the Grizzly and New Albany mines contemplate the erection of a 100-stamp mill. Since the company took the property large and valuable bodies of ore are reported to have been uncovered, and a great quantity of medium and low-grade rock is in sight. The most recent discovery of importance was made at the 900-ft. level, where the vein is 15 ft. wide, three feet of which is high-grade ore. A 20-stamp mill on the Grizzly crushes the ore from both mines, but a larger one is considered necessary to enable the handling of the low-grade ore profitably.——The Murphy Ranch mine, near Big Oak Flat, is being unwatered for inspection.

Tuolumne, April 10.

COLORADO.

Boulder County.

Arnold Hughes reports finding a three-foot vein of tungsten ore in the Mystery tunnel, near Eldora. The tunnel is in 160 ft. and cuts the vein 120 ft. in depth. A drift will be driven on the vein a distance of 200 ft. to tap the ore-shoot uncovered in the discovery shaft of the Mystery claim.

The United States Corporation tunnel is in over 1,500 ft. and 300 ft. more will cut the Klondike vein. The tunnel is being driven at the rate of 100 ft. per month. It is the intention to put on a double shift May 1. The Monroe vein, 600 ft. from the portal of the tunnel, is being developed with satisfactory results, 12 in. of sulphide ore showing in the face of the drift, which is in 60 ft. W. Mitchell, for a long time superintendent of the property, has been succeeded by G. Kneal. of Boulder. Mr. Mitchell takes charge of the United States Corporation's property at Sugar Loaf, which is to be extensively developed this season.

Clear Creek County.

A contract has been let to Peter Hector to drive the Wilcox tunnel an additional 1,000 ft., which will take the tunnel to the 4,900-ft. point, and to, if not beyond, the Kitty Ousley vein. Work has been commenced by Mr. Hector.——The three-compartment raise from the tunnel on the Commonwealth vein is about 160 ft. The ore-streak has been continuous.——In addition to the strike of 15 in. of copper pyrite on the Paymaster vein, there is adjoining the solid ore, similar ore, but more scattered and about two feet in thickness, of fine concentrating material. Superintendent Tingle says that in all the veins cut by the tunnel none show any appreciable amount of galena or zinc-blende, while the surface workings on the same veins produce nothing but galena and zinc. The line of the change in the character of the ore has not as yet been determined. Gold and copper have replaced the lead and silver, although the copper carries silver in addition.——Preparations are being made to resume work on the Stevens mine, and the mill will be put in operation as soon as there is a sufficient supply of water. It is the intention of the management to sink the shaft on the tunnel level to greater depth.——Grubb & Co. made a shipment from the Stemwinder last week that milled 99 oz. silver per ton.——Garbolino & Co. had a 13-ton shipment from the Comet which ran 40 oz. silver per ton.——A cave-in occurred on the Fort Dodge last week, 200 ft. in, which uncovered a vein of ore overhead.

Four men have been put to work in the stope on the Junction level of the Bonanza tunnel and shipments will soon commence.——The Terrible mill, which has been closed several months on account of the scarcity of water, was started up the first of the month.——Work has been going on for some time on the Pueblo property on Griffith mountain. The adit is in 700 ft., and a streak of lead and zinc ore has been opened up.——Lawrence & Robeson are about to complete negotiations for the Hall tunnel, which is in 3,500 ft. They intend to drive the tunnel ahead to cut the 1,000-ft. shaft of the Colorado Central mine, from which point the Hall properties can be easily and economically worked. It is thought that this will lead to the consolidation of the Colorado Central-Allunde and Hall properties, which will make one of the greatest combinations in the State.

Gunnison County.

More than 10,000 ft. of the Gunnison tunnel has been completed. The number of feet completed from each heading is as follows: Heading No. 1, 2,885 ft.; No. 2, 3,336 ft.; No. 3, 1,274 ft.; No. 4, 2,643 ft. Several accidents and breakdowns have occurred in the past few weeks to delay work, although at no time has work ceased on all headings, nor has more than two or three days elapsed before work was resumed. A large flow of water has been struck in the tunnel and pumps have been ordered and will be installed soon.

Ouray County.

Work has been continuous at the Bright Diamond and Memphis through the bad weather, and the shaft in the Bright Diamond is down 125 ft. and sinking. It is expected that the quartzite in which the shaft has been sunk will soon be passed and ore found beneath. Development has been going on in both mines. Fourteen men are employed in the Memphis and the Bright Diamond, and as soon as the quartzite in the Bright Diamond has been passed the force will be increased. All the mines north of town are looking promising.

At the Mineral Farm, near Ouray, all the machinery is now at the mine and its installation nearly completed. Wires will be run from the lines of the Telluride Power Co. to the mine and the machinery will be operated by electricity.

Work on the main tunnel at the Joker, near Ouray, has been stopped and crosscutting to the Yankee Girl started. Thirty-five men are employed.

Snow is reported to be five feet deep, and in the Park it is more than six feet deep.

The production of ore from the mines north of Ouray is being investigated. Plans have been under consideration for some time past for the re-opening of the old pyritic smelter, but nothing has been done in the matter as yet. It is believed, however, that the Slide-Newsboy, Bright Diamond, Black Girl and other mines in that district will produce sufficient ore to pay for the opening and operation of the smelter. There is a large amount of low-grade ore in the vicinity which hardly pay for shipping to Salida or Pueblo, but which would net good returns to the owners were the local smelter to be put in operation.

The Bachelor mill, near Ouray, is being repaired and will be operating within a short time. A large amount of ore is ready for treatment, and the output of the mines in that neighborhood will be increased as soon as the weather permits. Newton, Carr & O'Byrne, who are leasing on the Bachelor, will contribute materially to the operations of the mill. At present there are 60 men employed in the vicinity of the Bachelor, and it is said that the force will be increased to 100 men within the next 30 days. The ore-shoot of the Bachelor was discovered in the early '90s and has since produced a large amount of high-grade ore.

Park County.

(Special Correspondence.)—The Alma district is more prosperous than for some years past—no idle men, more properties shipping, fewer empty buildings, and an air of prosperity are noticeable.

The Moose is shipping and has struck some high-grade silver ore, which looks AI. Just what this strike will develop into remains for the future to determine. The Moose ore is packed down the mountain. The Atlantic is shipping and the showing is good for a continuous shipper.

The Hock Hocking is again in good ore and is shipping. This property has some low-grade zinc-lead ore blocked out, all of which carries some silver.

The Clipper is shipping and now has four four-horse teams hauling ore.

The Russia is shipping some fine ore, which is packed down, and anyone who thinks that packing ore from above timber line at this time of the year is a summer picnic should go up and make one trip with the packer, and just help dig out a few of the jacks after they are stuck in a snowdrift—temperature about zero and wind blowing a gale. That is one reason why a packer 'cusses' so hard; it seems to keep him warm.

The London is shipping a fine lot of ore; has four four-horse and three six-horse teams hauling. This is one of the big mines of Colorado. The principal values are in gold. The London fault is receiving a lot of attention just now. Pawless, Wolf, and others, are doing some development on the London fault, near the south end, on Sheep mountain.

Several other properties have ore out and are ready to ship as soon as the snow is off so they can get it packed down.

The Snowstorm Hydraulicking Co. is making arrangements to begin work with a force about April 15.

Alma, April 7.

Summit County.

(Special Correspondence.)—There have been several strikes of importance in the Frisco camp within the last week. Albert Newton, who is developing claims on the southeastern side of the Masontown Mining & Milling Company's property, has unearthed some rich float. It comes into his tunnel in the form of quartz carrying free gold. Assays of this have given from $5,000 to $15,000 per ton. On the Royal group, on the north of the Masontown property, Linquish & Heckman have sylvanite float which returned $3,780 per ton gold by assay.

The Masontown Co. are arranging to sink their main shaft and prospect for the vein from which this rich rock came and are also intending to work the rich sulphide ores which are opened up in the lowest level.——The Mary Verna Mining Co.'s main tunnel is in 740 feet.

The North American Mines Co. are pushing their tunnel into Peak I of the Ten Mile range. It is in over 1,000 ft. Driving on the large orebody recently passed through has been discontinued temporarily.

The Square Deal Mining & Development Co. is taking out a shipment of high-grade ore to be sent to the smelter and also a quantity of lower grade ore to have a mill run made at the Denver Ore Testing & Sampling Works. Their main tunnel is in 360 feet.

At Breckenridge the main tunnel of the Old Union Mining & Milling Co. has intersected the Old Union vein, 125 ft. below the upper workings and between the No. 1 and No. 2 shafts. This vein is 75 ft. from the Union vein along which the main tunnel was driven and which showed up good ore for over 1,000 ft. The water in the old workings will be taken out prior to making connection.

A lease has been secured by local operators on the Sultana group in the Yuba Dam Flats on the Blue river. This property is owned by St. Louis people who have not operated it for several years. It has a record of large production for silver, lead and zinc.

In the Country Boy mine on Nigger Hill the Lanyon Zinc Co. has an excellent showing. There is a two-foot streak of 45% zinc ore showing in the drift. Another carload shipment has been made and more are to follow. The lessees of the Germania mine have shipped another car of high-grade silver ore. The lower grade is being sent regularly to the market. The Colorado & Wyoming Development Co. have made a contract with the Old Union Mining & Milling Co. to deliver 2,000 tons of its dump ore from the Wellington mine for treatment at the latter company's mill.

Breckenridge, April 8.

(Special Correspondence).—The Pennsylvania mine of Argentine shipped several cars of silver-lead ore last week through the local branch of the Chamberlain & Dillingham Ore Co.

The management of the Old Union mine has now a force of men raising on ore recently struck in the main tunnel in the Old Union vein. This work, when carried up 125 ft., will make connections between the old upper workings and the lower workings of the new tunnel, giving free access of air without the necessity of the furnace which now supplies the ventilation.

The Abundance Mining & Milling Co. are making good headway with their main tunnel into Mineral hill. They are now in 460 ft., and three days ago passed through a small vein of good lead-zinc ore.

The Reliance gold dredge, in French gulch, started its season's work on Monday, the 9th inst., and is excavating about 2,500 yards per day.

C. C. Acton, owner and operator of the Chester mines in Summit gulch, is taking out a large quantity of free-milling gold ore which will average $20 or over per ton. This he will start to treat in his little mill early next month. The richer streaks of his six-foot vein run $500 to $600 gold per ton, this grade being shipped direct to smelters.

The Gold Dust Mines Co., operating on Nigger hill, has just received a carload of pipe and machinery for their long tunnel and to enable sinking below that level. The tunnel is in 3,500 ft., and the vein they are now working on is from 12 to 18 ft. wide, and three feet of this is high-grade silver-lead ore, the remainder being concentrating ore. Sinking will be started at once on a rich shoot and a pump installed.

The Laurium mine, in Illinois gulch, has been purchased from Niles & Walker, and the new company intends to enlarge the present mill and put on a large force.

Breckenridge, April 9.

Teller County.

The Portland Co. at Cripple Creek has begun working three shifts in nearly all parts of the mine. Up to the present but two shifts have been employed. The men will be lowered and hoisted through No. 2 shaft, from which operations throughout more than 30 miles of workings of the property will be directed. The two shifts in the Lowell shaft will be doubled into one, and in this department of the mine there will be room for two additional shifts. There is considerable ore in sight tributary to the Lowell shaft and its contiguous workings. It is believed that the production of the mine will be but little curtailed from its monthly average, as there are many ways in which the loss entailed by the fire may be almost made up.

The output for the month of March was $1,382,500, with a tonnage of 45,410. This is a falling off from February of $68,000, and the decrease in tonnage is 2,000. This is accounted for from several different facts.

The Findlay has been closed down throughout the month, the Portland fire caused a curtailment from this big producer. The flood in the El Paso was another feature, and the destruction of the Dorcas mill at Florence by fire helped to make the decrease. Another feature was that no cyanide mills are now in operation in the Cripple Creek district, although several will probably

be treating ore this month. The following table gives the individual treatment of ore by mills and smelters:

	Tons.	Total value.
Smelters	9,610	$480,500
Portland	8,000	208.000
Dorcas	1,800	45,000
U. S. R. & R.	25,000	625,000
Economic (Est.)	1,000	24,000
Total	45,410	$1,382,500

MISSOURI.

Jasper County.

The output of Joplin district in the first quarter of 1906 amounted to 128,526,240 lb. of zinc, which sold for $2,874,875, and 18,928,730 lb. of lead, which sold for $663,-725, the total value of both being $3,538,700. During the corresponding period in 1905 the production amounted to 113,885,470 lb. of zinc, which sold for $2,767,540, and 3,703,040 lb. of lead, which sold for $397,-435, a total value for both of $3,164,475. At this rate of increase throughout the year, the output for 1906 shows an increase of $1,500,000 in value of production over 1905. If the output of the last three months is maintained throughout the year a total value of $14,154,800 would be reached, as against a total value of $13,302,800 in 1905. The zinc ore market in the past month has been steady with top grades at from $49 to $51 a ton, the latter price prevailing early in the month, then weakening to $49, and again advancing to $51 a ton. During the past month the price of lead has fluctuated between $72 and $78, as compared to a top price of $58 a ton in the same time last year.

NEVADA.

Churchill County.

(Special Correspondence).—At present Fairview, a camp established about two years ago, is attracting considerable attention. In the range extending southerly from Fairview there are many prospectors, and one district, 20 miles south, called Monte Cristo, reports numerous promising discoveries. A large number of prospectors, miners, and adventurers of every class are rushing into the region in search of gold. Thus far the work being done is of a superficial character, as more attention is given to locating as many claims as possible, rather than to their development.

Fallon, April 7.

The Nevada Sand Springs Mining Co. has been organized at Reno by G. T. Crosby, J. M. Fulton, C. E. Clough, W. H. Wood and H. Anderson, all of Reno. The claims owned by the company are the Wild Rose, Lost Mule, Surprise and Copper King. On the Wild Rose there is a 60-ft. tunnel. Assays from quartz in this tunnel run $18 gold. Good assays have also been had from the Lost Mule, in a surface cut. A peculiar feature about these properties is what is known as the blue blow-out on the Eagleville and Austin road. Assays from this run $7 gold, on the surface. Five miners left recently to begin work on the Wild Rose, where a crosscut will be made.

A dispatch from Carson states that the newly reported gold discoveries near Cooney Springs has resulted in a general stampede to that section. It is said that early Wednesday morning a string of vehicles and autos left Carson for the new goldfields, Cooney Springs, and the town seems to have been almost deserted with the pell-mell rush for the new scene of the latest excitement. News comes from Virginia City and other towns that the stampede has affected them in the same manner. Tonight there are rumors of another strike within 20 or 30 miles of this city.

Esmeralda County.

Pfeifer, Kelly & Denham have a five-foot ledge of milling rock, near Aurora, and are building a new ore chute and will increase their force of men.——The McKeough Co. are piling up good ore and getting more blocked out in the mine.——The J. S. Cain Co. are working a night and a day shift on their mill, which is nearing completion.——The ore chutes of the Junietta are filled and they will have 5,000 tons of ore blocked out by the time the mill is ready to commence crushing.——Anderson is pushing development on his claims as fast as the weather will permit.——Clayton, Peterson & Co. have been handicapped by the bad weather, but are now blocking out ore and getting ready for the time when the snow will permit hoisting.——Cotton & Barnes, of the Big Injun Co., last week bought a group of three claims, paying cash therefor. They have a force putting the road in condition to permit the hauling of mill and other machinery, now in transit. The mill has a capacity of 15 tons daily. The millsite is being graded and a tramway surveyed. The tram will be one mile long. A large force of miners will be put on and systematic work pursued. The company owns 20 claims 14 miles west of Hawthorne.

Lincoln County.

(Special Correspondence).—There has been more activity here within the last ten days than ever before, and with the present boom there is no question but that Searchlight will be heard from as favorably, as her northern sister camps. Four mills are running night and day, and two more will be added to this list within the next thirty days.——A new strike of copper ore has been made three miles east of town; it has been reported that the vein measures 40 ft. across and has well-defined walls.——Matt Hoveck, superintendent and a director of the Montgomery-Shoshone mine, of Bullfrog, has bought an interest in the Cyrus Noble Extension here, and is president of this new company. L. L. Patrick and others of Goldfield, Bullfrog and Manhattan, have also acquired interests in this camp. This company has secured good property, and it is to be developed under supervision of Robert Lanka.

The Searchlight Diamond Gold Mining Co. commenced operations on their property this week. This company owns three claims one mile west of the Pompeii, and has three ledges traversing the ground; two are east-west leads, while the north-south lead is supposed to be the Cyrus Noble-Quartette vein. The ore at the bottom of the 65-ft. shaft runs $16 per ton. An electric plant, including hoist and pump, is now being installed.

Searchlight Parallel has opened a large body of ore on the 450-ft. level; drifting on the upper levels continues in order to block out the orebody that is now in sight. The company will continue sinking to such depth as the present hoist will permit.

The Searchlight Western Telegraph & Telephone Co. are extending their line to El Dorado Cañon; this should be completed in 15 days. This line will be of great assistance to El Dorado cañon as that district is the scene of much activity at present.

In El Dorado cañon district a strike has been made 150 ft. north of the Venus working shaft of free gold ore. A trench on a parallel ledge has opened up ore that will average $22 per ton, this being the general average for several feet. The Mountain group, which borders on the Venus, has a 30-ft. shaft in high-grade milling ore; the east drift exposes two feet of $500 ore, while a six-inch streak in the west drift runs $2,000 per ton gold. Several open cuts have been run, exposing good ore in a ledge that is from 40 to 60 ft. wide.

Searchlight Mining & Milling Co. have secured such good results in their recent developments that they have decided to add 10 stamps, making 20 stamps all told. This will mean a general increase in the equipment of machinery.

The Golconda Mining Co. has a force on their properties and intend to sink the shaft to the 300-ft. level. This property, which adjoins the Searchlight Mining & Milling Co., has an immense ledge running east and west through its entire extent. This is a new company, and they intend to install machinery in the near future.

Searchlight, April 8.

Three miles east of Searchlight, near Summit Springs, C. A. Caughman, F. J. Flanagan and J. H. Connors have located a mineralized zone traceable for a mile or more and having a width of anywhere from 60 to 400 ft. Little work has been done as yet, but it is believed that it will run well in copper, for besides the copper stain there is a heavy iron cap. The main showing is on the Minnie Haley, one of a group of five claims. A townsite has been taken up and named Emerald City. The strike is about a mile and a half east of the Quartette. The walls are well defined and the vein filling is decomposed quartz-porphyry, with some quartz. The whole vein is covered with a capping a few inches in thickness.——Installing the new air compressor at the Quartette is completed, and in a few days the drills will begin work on the ninth level, which is now opened for a distance of 50 ft. to the east and 30 ft. to the west, both drifts in ore, but the main ore-shoot is still some distance away.

Nye County.

(Special Correspondence).—In this district are many good showings and some established mines. One of the best mines in the district is developed to a depth of 700 ft., showing that the veins go down, assaying from $2 on the croppings, up into the hundreds per ton in gold in depth and increasing from two feet at surface to 30 ft. at 500 ft. depth.——New arrivals are changing conditions in this camp for the better. Miller and Lamprey have resumed sinking on their Silver mine, receiving via Salt Lake Railroad a quantity of lumber and general supplies. They are taking out ore for shipping.——Morrison, Place & Gould are also preparing to ship smelting ores.——'Trail' Johnson of Utah, who owns a group of mines on the east side of the Johnnie townsite and covering part of said townsite, has a shaft down 40 ft. and in a crosscut has the contact on west side with a fine body of good ore with a gouge. Another oil find is reported in Ash Meadows east of here a few miles.——The Lucky T. Co. are still driving their tunnel for the junction of their two big veins, under management of Mr. Muir. This company has driven a long tunnel at great expense, but surface work has proved they have a mine.—Rathburn, the company's storekeeper, is opening up a fine-looking body of ore between the Congress Co.'s grounds and the Bonanza Queen. He has only a fractional claim, but in this camp fractions are O K. He is postmaster, district recorder, notary and almost everything.——Fred Boller has leased some ground of the Johnnie Consolidated Co., which he says prospects $100 per ton on the croppings. He came here from Bullfrog last winter.——A company is being organized to open up the Del Oro mines, a group on the west of town, as soon as lumber, tools, supplies, etc., can be brought in. This property has shown $200 to $800 gold per ton. He has done enough work on it to justify further development. A mill will be erected this coming summer. The company has plenty of water for all purposes and ore enough on their claims to keep a mill running.——A. C. Swain while doing location work on a claim west of the Johnnie townsite has struck a 12-ft vein of mineral running through the townsite. It has a fine, soft gouge of yellow ocher carrying free gold; the quartz looks promising, but no assays have yet been made of it.——The Congress Co., Ramsey, Butler, Ish & Co., of Tonopah, owners, are getting ready to install a mill this coming summer after hoisting by whim and mule power all winter.

We shall soon have daily stage communication with the railroad as the sidings, etc., are being put in at Station 73, 30 miles northwest of Indian Spring on Las Vegas and Bullfrog (Clark's Railroad). Arrangements are also being made to have mail come the same way. With the advent of railroads, thousands of acres of Ash Meadows country will be settled by farmers and stock raisers, as there is an abundance of water for irrigating.

Johnnie, April 4.

(Special Correspondence).—From a group of claims 16 miles southeast of Las Vegas, locally known as the Catlin claims, come some good assays, showing high in gold, one being more than $1,000. The property has a shaft down 30 ft., this being the only work. There are a number of owners, and they are not all here, so it is difficult to say what will be done.——To the northwest from Las Vegas about 30 miles the Siebert group of silver-lead properties are piling up ore.——The Lane claims, on the Colorado river, 30 miles east, continue to show good results, but no systematic work is being done.——The washout on the S. P., L. A. & S. L. railroad north of here, which occurred March 24, is not yet repaired.

Las Vegas, April 10.

The Cowboy and Mother Lode mining companies are reported to have made big strikes. The Mother Lode Co. opened up ore last week on the Mule Skinner claim in the 60-ft. tunnel that will run $1,000 to the ton. The Mule Skinner claim adjoins the Manhattan Consolidated mine. On lease No. 4 of the Iron King, on the Cowboy Mining Co.'s ground, a rich pocket of gold ore has been encountered, some of which will run $10,000 per ton. On lease No. 3, at a depth of 40 ft., a four-foot vein was uncovered which shows free gold estimated from pannings to run $200 per ton.

Storey County.

Mr. Rae is preparing to start dredging operations in Gold cañon, representing the Virginia-Tonopah Dredging Co., owning 200 acres of ground in the vicinity of Dayton.—— Emmet Boyle is employing 10 men in development work on the North Rapidan and other ground owned by his company.—— The Ohio-Tonopah Co. has 20 men employed in blocking out what was formerly known as the Hulley-Logan mine, and has 500 ft. of backs. The company will erect a large milling plant this year. Several prospectors are also employed in developing their mining locations in the district.

A large sum of money is being raised in Virginia City and Gold Hill, Nev., for the forthcoming jubilee celebration of the discovery of the Comstock lode.

A find carrying high gold values was recently made by Goldfield prospectors near Cooney's ranch and springs, 16 miles northeast of Virginia City. For 25 miles to the eastward of Virginia City the hills are highly mineralized and other discoveries will probably be made. A stampede for Cooney's ranch is in progress. Flowery, Badger, Desert and Siegel districts are all in the same range of hills. There is water in the ravines and the Carson river is only three miles to the southward. A townsite has been surveyed and a new camp will soon come into existence in this section, which is west of Siegel district.

NEW MEXICO.

Dona Ana County.

In Ash cañon, San Andreas mountains, M. D. Gaylord and party have opened up five leads by blowing away with dynamite obstructions which covered old workings. When the Mexicans closed the mines they were sealed with stones and powdered lime rock mixed as cement, which soon took on the color of the cañon walls and obliterated all traces of the mine, the evidences of the workings having been carried back into the mine before it was sealed. Traces of smoke above former openings led them to prospect below, discover the cement and blow it out. Skeletons were found, and also rich ore. All the openings seem to belong to one mine, as they are close together.

Grant County.

(Special Correspondence).—C. P. Crawford, with Moses and Portwood, have secured a renewal of lease of shaft No. 7 of the Santa Rita mine at Santa Rita, and are shipping 50 tons of ore daily to the company's concentrator They are stoping an orebody several sets wide, and as soon as that is removed they have another ready to continue the work. The company attempted to work this same ground on several occasions, but failed each time to make the operation profitable. Crawford & Co. are making a good profit, demonstrating once more that leasers can make a profit where corporate management fails.

Santa Rita, April 8.

OREGON.

Baker County.

(Special Correspondence).—The mining country surrounding Baker City embraces such an extensive territory that no great excitement has ever occurred within its boundaries. The mineralized field is perhaps 100 miles square. It has never been carefully or scientifically prospected. Mining stampedes seem to occur only in districts of limited extent, where interest becomes centralized and enthusiasm escapes under pressure. Just now there is a copper excitement on, which approaches more nearly to a mining boom than anything eastern Oregon has experienced. The cause is the development that has been going on for about a year, at two points on the copper belt, twenty miles northeast of Baker City, and which has resulted in proving orebodies of magnitude and richness, and prospectors are flocking into this district.

The North American Co., an Iowa organization, pioneered the way into this section about six years ago, but subsequently became entangled financially, after which work ceased, to the discouragement of others who were watching the result. Two years ago an Indiana Co. commenced work on the copper belt, near Medical Springs, and recently, in a crosscut at the 200-ft. level, they have driven 25 ft. into a ledge of sulphide ore that will run five per cent copper, and about $5 per ton in gold and silver, and they have not yet reached the opposite wall. They have thousands of tons of ore on the dump, and are preparing for the erection of a reduction plant.

Following the success of the Indiana, the North American was revived last fall, and work resumed at their property at Burkemont, near the center of the copper belt, some time in December last. Fifteen feet below where work was suspended, the double-compartment shaft entered a body of native copper ore, carrying also gold and silver. Local interest is now centered on this property, as the shaft has been sunk continuously through 75 ft. of this ore, and the lower wall of the deposit is not yet in sight. A townsite has been laid off, a postoffice established, and the country on both sides of Burkemont is full of prospectors locating everything in sight. The North American is under the supervision of D. W. C. Nelson, who is planning for the erection of a concentrator. The native copper ore in this mine runs from four to six per cent in copper. At the present depth

of 230 ft. there are beginning to appear chalcopyrite and copper glance.

The distinctive feature of the ore deposits on this belt is their great size, which, taken in connection with the extent of this copper belt, justifies the belief that the copper interests of the country will some day include eastern Oregon among the important producers of the red metal. This furnishes also an explanation of the wide-spread interest among mining men now being focused on this district.

The gold camps surrounding Baker are manifesting unusual activity, as a reflex from the copper excitement. Many new properties are being opened in the Sumpter camp, which will be added to the list of producers during the coming year. One of the notable new properties is the Gold Coin mine, near Durkee. It is owned by Ayers & White, of Pendleton. This is a low-grade proposition in which the management proposes to quarry from a conglomerate ledge, 75 ft. wide, ore that will average about $5 per ton in free gold. They are adding to the 10-stamp mill, already on the property, 90 additional stamps, which will constitute this the largest mill in Oregon.

Another new property is being opened in a comparatively unknown district, about twenty-five miles east of Baker, where the Timber Canyon Co., under management of F. J. Davey, is erecting buildings preparatory to installing a mill. In this Timber Canyon mine, it is reported, they have three feet of ore that will average $50 per ton in free gold. Lying between this property and Baker City, in the old Virtue district, at least two new properties will be equipped with mills during the present year. They are the Dan and the Pat properties, on which developments are now in progress. The old Virtue itself, with a record of over $3,000,000 in gold, is steadily producing under the management of W. L. Vinson.

Baker City, April 7.

SOUTH DAKOTA.

Lawrence County.

In the mining operations recently undertaken on the piles of mill and placer tailing in Deadwood gulch, near the mouth of Blacktail, between Central City and Deadwood, several mill-runs have been made.

Fifty tons were treated in the first test run, and $2.80 in free gold per ton saved on the plates, the tailing (suitable for cyanidation) assaying, $5.88 per ton. During the test mentioned trouble was experienced by the breaking of screens and the free gold recovery was low. In a second test $3.40 per ton was saved by amalgamation, and tailing averaged $4.80.

A few feet from the mill a shaft has been sunk to bedrock where the bedrock is 32 ft. from the surface. The hoisting engine is set in the upper portion of the mill, and an incline track runs to the bottom of the shaft. The débris will be mined by open cut system no powder being needed. The ground is loose and can be shoveled. The company proposes to erect, lower down the gulch, a second amalgamating plant of 100 tons daily capacity, and a cyanide plant for both mills close to the second mill.

Pennington County.

J. B. Baker of Lead is making arrangements at Rochford to begin work on the Standby mine. This property has been worked at intervals since 1879. It is equipped with a 60-stamp mill. Mr. Baker will start work on the installation of an air compressor which is on the ground. Cold weather has interfered with this work.

Ten stamps will be fixed up and started. This will be an experimental run on several hundred tons of ore. It is reported that recently the workings have penetrated one of the best orebodies that has ever been opened up in the mine, and that the grade is good.

At Rapid City work has been in progress some time on repairs and alterations at the National smelter, in expectation of starting the plant on April 15. It will be operated as a custom plant, and it already has contracts with mining companies of the Northern Hills to handle their entire output of smelting ores, in addition to which part of its supply will be drawn from the mines along upper Rapid creek. It is proposed to start with one furnace and as soon as business warrants the other furnace will be blown in. The smelter will be in charge of C. H. Fulton, president of the State School of Mines at Rapid City.

The Mariposa Gold Mining Co , at Mystic, on Castle creek, has received machinery for the new plant, including gasoline engine, air compressor and rock drills. The company is equipping for systematic development.

UTAH.

Weber County.

(Special Correspondence).—The Oregon Short Line Railroad Co. has started a grading outfit to work on preliminary construction of a spur leading to the site of the new smelting plant, that will be erected by the Utah Smelting Co., seven miles north of Ogden. When this track has been completed, the material necessary for the building of the smelter will be shipped in and construction work of the plant will be commenced. It is expected that it will be completed and ready for business within six months. This plant will be the first independent smelting concern to enter the field since the trust gained control of all the smelting interests of the country and is, therefore, looked upon as an important move and one that may make Ogden a prominent smelter point. This can be better understood when it is remembered that two months ago Charles M. Schwab, under a threat to start an independent smelter on the coast, forced the trust to grant him a reduction of $5 per ton on all his ores. Mr. Schwab went so far as to lease an old abandoned smelting plant, near San Francisco, but when he secured the reduction mentioned he abandoned the idea of operating it. The actual operation of an independent concern would probably be favorable to the producers.

The Utah Smelting Co. is backed by a strong combination of capitalists, its president being David Eccles, of Ogden.

Ogden, April 7.

WYOMING.

The value of mineral output of Wyoming, as returned for assessment last year, was $1,710,612.23. The total tonnage mined was 6,006,883.14 tons, of which 534,879 tons were iron, and 25,000 tons were copper. The coal sold for an average of $4 per ton, and the copper netted the producers over $500,000.

The tax value per ton on coal and ores was fixed by the bill passed by the legislature four years ago, and is not the actual value of the product, thus explaining the vast difference shown in the valuation of the output for taxation, and the actual value. The tax on mines will bring the State about $50,000 a year.

Carbon County.

The smelting, concentrating, electric and steam power plants of the Penn-Wyoming Copper Co. at Grand Encampment was destroyed by fire on March 28. Loss is estimated at $300,000, partially covered by insurance. The smelter building was saved after a hard fight. The origin of the fire is unknown. The plant had been closed down for the winter on account of the deep snow and improvements under way.

J. B. Hassett, general manager of the Charter Oak mine, reports finding a vein of high-grade copper sulphide in a drift from the 200-ft. level in the mine, the vein being 2½ ft. wide and the ore running 48 to 50% in copper. A large body of low-grade ore was found adjoining the high-grade vein.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Windemere District.

What is reported to be the largest body of lead ore discovered in British Columbia has been developed this winter at Spillimacheen, half way between Windemere and Golden, and near the line of the Kootenay Central Railroad, upon which the work of construction is soon to begin. The mine, the Giant, is not a new find. While the once famous Blue Bell of Pilot bay, on Kootenay lake, was the first claim in all Kootenay to be recorded, it is claimed the Giant was first located. In the early '80s a mail carrier, who made monthly trips from Golden to Wild Horse, learned from the Indians that they procured the lead for their bullets from the west side of Spillimacheen mountain. The mail carrier, named Bray, got a prospector named Cannon, who was among the first in the Cœur d'Alene, to visit the find. When Cannon saw it he thought it galena, such as he had seen in the Cœur d'Alene, but an assay proved so disappointing that he gave the ground no further notice. Thomas Jones located the property in 1884, but nothing was done until 1890, when Mr. Jones did some work, which so improved the property that Mr. Cowell of Victoria bought it and did considerable development, finally closing down and allowing it to be sold 10 years later for taxes. Mr. Jones, who lives in the valley and is a practical miner, believing the Giant ground good property, kept it in sight, and when he found the claims for sale he got Mr. Devlin, of Golden, and Captain Armstrong, of the Upper Columbia River Navigation Co., interested, and they bought it. Mr. Jones began to work the claim last fall, and miners who have been employed say the ore today is remarkable. Several mining men have lately visited the mine and pronounce it great. E. A. Haggen, of the Frank Smelter Co., reported the vein to be 178 ft. wide, and the face of the crosscut was from 4 to 30 ft. high. A selected sample over the 178 ft., across the veins, assayed 3 oz. in silver and 79% lead. In the lower tunnel, 400 ft. below, the ore goes 12 oz. silver and 20% lead. Several carloads have been shipped and preparations are being made for next summer's work, and a bridge is being built over Spillimacheen river.

Yale District.

The output of Boundary mines for the week ending April 7 was as follows: Granby mines to Granby smelter, 14,038 tons; Mother Lode to British Columbia Copper smelter, 4,384 tons; Brooklyn-Stemwinder to Dominion smelter, 3,366 tons; Sunset to Dominion smelter, 875 tons; Emma to Nelson and British Columbia Copper smelter, 875 tons; Rawhide, 132 tons; total shipments for the week, 23,120 tons; total for the year to date, 336,485 tons.

Smelter treatment for the week was: Granby works, 16,641 tons; British Columbia Copper works, 4,220 tons; Dominion works, 4,373 tons; total for week, 25,234 tons; total for year to date, 351,950 tons.

The output of the Boundary mines for the week ending March 31 was as follows: Granby mines to Granby smelter, 16,366 tons; Mother Lode to B. C. copper smelter, 4,300 tons; Brooklyn-Stemwinder to Dominion smelter, 3,235 tons; Rawhide, 264 tons; Sunset to Dominion smelter, 960 tons; Emma to Nelson and B. C. smelter, 400 tons; Oro Denoro to Granby smelter, 150 tons; total, 25,675 tons. The output of the smelters was: Granby Co., 17,887 tons; B. C. Copper Co., 4,420 tons; Dominion Copper Co., 4,468 tons; total, 26,775 tons.

Shipments for the week ending April 7 from the Yale-Kootenay mines amounted to 30,970 tons, and for the year to date 460,018 tons. Shipments from Boundary mines were 23,123 tons, from Granby, Mother Lode, Rawhide, Ema, Sunset, Brooklyn, Skylark and Strathmore (the last named a new mine). From Rossland shipments were 5,485 tons, from Le Roi, Le Roi Two, and Centre Star-War Eagle. From Slocan-Kootenay the shipments were 2,216 tons, a record for this year, from St. Eugene, Sullivan, La Plata, Eureka, Hunter V, Black Prince, Broadview, Ottawa, Lone Bachelor, Queen, Kootenay Belle, Sallie, Second Relief, North Star, Whitewater, Ruth, Emerald, Majestic, Aurora, Silena and Queen-Dominion—the last three being new shippers. Ore reports at the smelters were: Granby, 14,068 tons; Dominion Copper, 4,564; Trail, 6,770; Hall mines, 761; Marysville, 500.

The B. C. Mining & Development Syndicate, with headquarters at Rossland, is preparing to ship more supplies to their mines near Marysville as soon as the roads will permit. They have had men engaged all winter under contract, and the ore is showing up well. They will increase their force and push work as fast as conditions will permit.

Mr. Leavick, representing capitalists of Colorado, has a number of properties under bond, the principal being the Mystery, owned by Robert Dwar, and situated on Alki creek. He has let a contract for the construction of a wagon road from the main road to the Mystery, and, as soon as this is opened, prospecting will be carried on by the aid of a diamond drill.

YUKON TERRITORY.

The dredging season in the Klondike has terminated, and so successful has been the record in that line of industry that there are prospects of five or six dredges being added to the number already here during the season of 1906. W. H. Isom, vice-president of the N. A. T. & T. Co.; J. M. Elmer, superintendent of the Bear creek dredge and the Lewis river dredge, and Otto Brener, managing director of the Canadian-Klondike Co., which owns the Bear creek dredge, the Williams Concession and water ditches, the French Hill hydraulic properties and plant, and other properties, are all likely to put dredges on the properties this year. Mr. Brener says two more dredges will be placed on his company's Bear creek property and the Bonanza Basin people plan to put in four more. It is known that Treadgold, who owns numerous claims on Bonanza, intends to put a dredge on Bonanza, and the Anderson Concession people are planning to put in two dredges, or more. The Moncrieff people may put in a new dredge, and others are working with similar intentions. It is likely that the majority of these dredges will materialize before spring, and that the White Pass will have another busy season hauling heavy material to Dawson. J. M. Elmer originated the dredging industry in the Yukon basin. He went to Dawson in 1901 with the Lewis river dredge, the first dredge of the Yukon basin and the north, demonstrated it a success in working the Klondike gravels, and last winter succeeded in persuading capital to put in the big dredge at the mouth of the Bear, which cost $200,000, and which has almost, if not quite, paid for itself since it started running for the first time, two months ago. Mr. Brener, of the same company, is also to be given credit for a good part in the financing of the company, but to Mr. Elmer is due the credit of demonstrating the Yukon as a dredging field.

MEXICO.

Chihuahua.

Weisel & Kock, engineers and contractors at Parral, expect to have completed the installation of Pedro Alvarado's 1,000-h.p electric power plant in the next six weeks. All of the machinery is on hand for this plant. It is to operate the Pamilla mine and Sr. Alvarado's rock quarries. The power plant being installed is arranged as one unit, and if it works satisfactorily, Weisel & Kock will install for Alvarado another unit of the same capacity.——The Naica Mining Co., of which G. C. Beckman, of Parral, is general manager, is sinking a shaft of the Felicidad mine in the Naica camp. The property consists of 45 pertenencias.——The Pittsburg Mining Co., B. M. Ray, superintendent, has installed new boilers and pumps and is unwatering its mines in the Santa Barbara section of the Parral district. The Cavaritas mines had been drowned out.——J. F, Johnston, of Parral, is working five mines, three in Chihuahua and two in Durango. Those in Chihuahua are, one near San Francisco del Oro, in the Parral district; one near El Valle, and another in the Sierra Almoloyo district. Those in Durango are, one near the San Juan de Nuñez and the second near San Jose de la Paz. Most of these properties are lead-producing. Mr. Johnston is planning a smelter for Jimenez.——The mine operators of the Santa Barbara section of the Parral district are complaining of car shortage, which prevents the shipment of ores to the smelters. In the vicinity of Santa Barbara there is a greatly increased activity in mining, and the output of ores of shipping grade is the result, but the Mexican Central has been unable to furnish the cars.

Obituary.

ROBERT PFLUEGER, of 927 Linden street, Oakland, Cal., a pioneer miner of Nevada and California, died on April 2 at his home, aged 85 years.

JOHN CHRISTIAN KAFER, past-president of the Engineers' Club, died at Trenton, N. J., on March 30, at the age of 64 years. He had for years been an active member of the Engineers' Club, and was for years connected with the iron industry.

NATHANIEL SOUTHGATE SHALER died at Cambridge, Mass., on April 10. As dean of the Lawrence Scientific School, of Harvard University, he was widely beloved by the men of two generations, and as a geologist he achieved an early distinction. Professor Shaler was born at Newport, Ky., on February 20, 1841, and therefore was more than 65 years of age. After graduating at Harvard in 1862, he served for two years in the Union army during the Civil War and subsequently, in 1868, he became instructor in geology at the Lawrence Scientific School and eventually full professor. He was the author of many books and possessed an extraordinary range of literary talent. His writings include a text-book on geology, popular treatises on this subject, pamphlets on paleontological and geodetic matters, a number of volumes dealing with sociology and finally three volumes of verse, dealing in dramatic form with the Elizabethan period. But Shaler will be remembered for himself as long as his writings are read, which means that the man was a greater influence than the pen he wielded. Like Werner he possessed to a rare degree the power of stimulating the enthusiasm for scientific study, and it was that more than the matter of his lectures that made him a powerful teacher. He was beloved of the Harvard students, who came to him for advice and encouragement. Few scientific men had such a wide acquaintance, and to none will it be given to be remembered more affectionately.

Personal.

C. W. PURINGTON is at Boston.

ALBERT F. HOLDEN is in San Francisco.

J. M. MCGEE, of Oroville, is at the St. Francis.

F. F. SHARPLESS is on his way to the Northwest.

CHARLES CLAY, of Forest Hill, is at the Occidental.

W. G. MOORE has left London to proceed to Borneo.

J. H. KINKEAD is in San Francisco, from Virginia City.

F. C. ROBERTS is inspecting mines in Durango, Mexico.

GEORGE J. BANCROFT has returned to Denver from Mexico.

THOS. H. LEGGETT is expected in New York, from Mexico.

W. E. DEFTY has gone to Los Angeles, on his way to Sonora, Mexico.

W. C. WYNKOOP is visiting San Francisco from Tonopah, Nevada.

EDGAR RICKARD has returned from his visit to Denver, Chicago and New York.

HORACE F. EVANS is investigating mines near Granite Creek, British Columbia.

CHARLES MADDOCK has arrived in New York on his way from London to Mexico.

JAMES A. SNEDAKER, of Denver, was in San Francisco, on his way from Nevada.

JOSEPH LUCE, of Salt Lake City, has come to California to take a well-earned rest.

FREDERICK GRUNDY, of Los Angeles, is in northern Arizona on professional business.

A. H. CURTIS, manager of the Clifton mine, in Rhodesia, is returning to England.

P. W. K. ROBERTSON is general manager of El Plomo mines, at Altar, in Sonora, Mexico.

R. J. WISNOM, in charge of the Butters cyanide plant at Virginia City, is in San Francisco.

F. A. STEARNS has returned to San Francisco from the Aros river, in Chihuahua, Mexico.

T. C. CLOUD, of the firm of Steinhart, Vogel & Cloud, London, is on his way to the Argentine.

HAROLD RICKARD has resigned as superintendent of the San Rafael mine, at Zacatecas, Mexico.

GEORGE W. MAYNARD visited San Francisco on his return from Sonora, Mexico, to New York.

W. H. TREGANOWEN, recently with the Champion Reef mine, in India, is on a visit to England.

H. R. PLATE has gone to Idaho to examine mines; will return to Denver about the end of April.

F. J. BOOTH has gone to Mexico to accept a position with a copper mining company in Chihuahua.

R. D. RHODES, superintendent of the Mammoth smelter, at Kennet, Cal., is at Salt Lake City.

EDMUND JUESSEN will be in Utah the greater part of April, making mine examinations.

JOHN HANLON, superintendent of the Crownpoint mine, near Prescott, Arizona, is visiting San Francisco.

E. W. SEBBEN has recently returned to Denver from a long stay in Arizona, where he examined a number of mines.

HOPE NICHOLSON has been appointed superintendent of the Cosmopolitan mine, at Kookynie, Western Australia.

H. E. WEST sails from Vera Cruz on April 4 to take the technical management of the Berlanga lead mines in Spain.

FREDERICK LEON is in charge of the San Francisco office of the United States Smelting, Refining & Mining Company.

R. H. BURROWS has resigned as manager of the Mineral Development Co., and has opened an office at Guanajuato, Mexico.

FRANK LONGMAID has severed his connection with the Vacas Mining Co., of Durango, and has moved to Cleveland, Tennessee.

J. C. DALY, JR., of Boston, has gone to Hayden Hill, Lassen county, Cal., to accept a position with the Hayden Hill Mining Company.

EDWIN C. HOLDEN is at St. Luke's Hospital, Denver, recovering from a broken leg, sustained while engaged in professional work in New Mexico.

GEORGE S. BINCKLEY, who is constructing an electric railway and complete water-works system for the city of Monterey, Mexico, is in San Francisco.

F. R. HUTTON has resigned as secretary of the American Society of Mechanical Engineers, but he is likely to be elected honorary secretary, with a paid secretary as assistant.

EDWARD H. NUTTER has resigned the superintendency of the Standard Mining Co., at Bodie, to become assistant superintendent at the Liberty Bell mine, at Telluride, Colorado.

WILLARD S. MORSE is about to go to Europe on a prolonged leave of absence, and in consequence the executive committee of the American Smelting & Refining Co. has placed the affairs of its southern department in the hands of WILLIAM C. POTTER, EDWARD C. KNIGHT and T. S. AUSTIN, with headquarters at Aguascalientes, Mexico.

Latest Market Reports.

SAN FRANCISCO, April, 12 1906.

ANGLO-AMERICAN SHARES.

London, April 12, 1906.

	£ s d		£ s d
Camp Bird	1 4 6	Oroville Dredging	0 18 0
El Oro	1 8 1½	(ex dividend	
Esperanza	4 4 0	Stratton's Independence	0 7 6
Dolores	1 17 6	Tomboy	1 8 9

(Cabled by courtesy of William P. Bonbright & Co., New York).

MINING STOCK MARKETS.

NEW YORK QUOTATIONS.

(On the Exchange and on Curb. April 12, 1906.)

Amalgamated	$1 01½	North Butte	$ 84⅛
Anaconda	371	Old Dominion	44¼
Bingham Copper	39	Shannon	7
Calumet & Hecla	695	Tennessee Copper	46
Daly West	14¾	Tonopah-Nevada	18
Granby	12⅝	United Copper	67
Greene Consolidated	31	United States	60⅛
Nevada Con. Copper	17⅝	Utah Copper	27½

SAN FRANCISCO QUOTATIONS.

[Comstock.]

Con. Virginia	$1 35	Ophir	$5 37½
Hale & Norcross	1 15	Potosi	0 19
Mexican	1 15	Savage	1 00
Exchequer	0 58	Yellow Jacket	0 12

[Tonopah and Goldfield.]

Belmont	$5 37½	Montana-Tonopah	$2 80
Golden Anchor	1 00	Ohio-Tonopah	0 42
Jim Butler	1 37½	Red Top	1 87½
Jumbo	1 60	Sandstorm	1 10
Kendall	0 81	Tonopah Ex	11 00
Midway	3 10	West End	3 10

(By courtesy of E. F. Hutton & Co., Kohl Bdg., San Francisco.)

METALS.

SILVER.—Per oz., Troy: New York, (by wire), bar silver, 64½c. per fine ounce; San Francisco, 64½c.: London, 29¾d. (standard ounce, 925 fine); Mexican dollars, 50@51c., San Francisco; 49¾c., New York.

COPPER.—Herewith are given the average prices of copper for the periods specified, as received by wire from New York:

	Week ending April 12.	Week ending April 5.	Average for March.
Lake	18.62@18.75	18.62@18.75	18.50@18.67
Electrolytic	18.25@18.50	18.25@18.50	18.24@18.43
Casting	18.00@18.25	18.00@18.25	17.87@18.17

Mill copper plates, 21c; bars, 21@24c. London, £84 10s. 6d.

LEAD.—New York (by wire, average for week ending April 12), $5.35 per 100 lb; San Francisco, pig, 5.70@6.60c. per lb.; pipe 7¾c.; sheet, 8¼@9¼c.; London: £15 15s. ℔ long ton.

SPELTER.—New York (by wire, average for week ending April 12), $6.07 ℔ 100 lb.; London, £25 12s. 6d. ℔ ton; San Francisco, ton lots, 7c.; 100-lb lots, 7¾c.

TIN.—New York, pig, $38.30@38.65: bar tin, ℔ lb., 42¼c.; pig, 39c. London, £176.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, nominal, $23@25 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$41.50, large lots; London, £7 7s 6d.; San Francisco, local, $39.00 ℔ flask of 75 lbs.

NICKEL.—New York, 48@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.; dust, ℔ lb., 10c.; sulphate, ℔ lb., 4c.

BABBITT METAL.—San Francisco, No. 1, 10½c.; No. 2, 8c.; No. 3, 7½c.; extra, 17½c.; genuine, 32½c.; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

ALUMINUM.—No. 1, 99%, small lots, 35@38c. ℔ lb.; 100 lbs., 35c.; 1000 lbs., 34c.; ton lots and over, 33c., Pittsburg. No. 2, 90%, small lots, 34c.; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, 18.10@$18.35; gray forge, $16.85; San Francisco, bar, 3½c. ℔ lb., 3¾c. in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.00 open hearth billets, $28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 8½c.; less than 500 lb., per lb., 8¼c.; in 25-lb. tin pails, ¼c. ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lb. per case, ¼c. per lb. above keg price. Dry Lead.—In bbl., 1 ton and over, 8c.; do. in kegs, 8¼c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $1.85; Cut, $1.75. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, per quality, 18½@19½c; San Francisco, 1000-lb. lots, 20c; 300@500-lbs. 21c, 100-lb. lbs. 22c; 100-lbs lots, 23c.

BONE ASH.—Extra No. 1, 6c ℔ lb; No. 1, 5c½.

BORAX.—Concentrated, 9½c ℔ lb; powdered, 10c; fused, 25c; crystal, refined, 8c.

CANDLES.—Standard Oil Co.—Electric light, 16 oz., 11½c: 14 oz.,10½ c; 12 oz., 9c; Hotel, 12 oz., 9½c; Granite (mining), 16 oz., 11½@12c; 14 oz., 10½@10¾c; 12 oz., 9¾c; 10 oz., 9c; Paraffines, White, 1s, 2s, 4s, 6s, 11c; 12s, 11½c; colored, 1c higher; Radiant Paraffines, 4s, 6s, 14 oz., 10½@10¾c; 10 oz., 8c.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 6½@7c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1½@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

COAL.—San Francisco, coast, yard prices to dealers: Wellington, $7.50; Seattle, $6.50; Coos Bay, $5.50; Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $14.00; Cannel, $8.50; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17c; Astral, 17c; Star, 17c; Extra Star, 20c; Eocene, 19c; Elaine, 26c; Water White, in bulk, 10½c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24½c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 15½c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 65c; cs., 70c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 53c.; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 57c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MOLYBDENUM.—98@99% N. Y., $1.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

RED LEAD.—500 lb. and over at one purchase, ℔ lb., 8½c.; less than 500 lb., 8¼c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., 90c.

URANIUM.—Oxide, ℔ lb., $3.40.

Commercial Paragraphs.

W. E. DEFTY, of Phœnix, Ariz., has placed an order for mining machinery with the Fulton Iron Works, of San Francisco.

THE Denver Balance Co., 3000 Larimer street, Denver, manufacturers of assay balances, are doubling their floor space on account of increased business.

N. D. PHELPS, manager of sales, and CHARLES E. BRUFF, mining and crushing department, Power & Mining Machinery Co., have returned to Milwaukee from Salt Lake City and Denver.

CHARLES WAINWRIGHT, formerly superintendent of the Blaisdell Machinery Co., of Bradford, Pa., is now superintendent of the Bury Compressor Co., Erie, Pa. S. R. Warner, for years with the Ball Engine Co., of Erie, Pa., is now general States manager for the Bury Company.

THE suit of the De La Vergne Machine Co. against Theodore Kolischer and the Standard Ice Manufacturing Co., of Philadelphia, Pa., which was taken to the Supreme Court, has been finally decided in favor of the De La Verge Machine Co., and a judgment amounting to $130,706.33 rendered in their favor.

THE executive force of the Mine & Smelter Supply Co., consisting of J. H. Fennessy, president; A. L. Fennessy, treasurer; C. N. Tibbitts, general manager; A. E. Loizeau, assistant secretary; W. B. Kinkead, purchasing agent, and F. A. Fleish, traffic manager, will have their general offices at 42 Broadway, New York. A. H. Seep will remain in Denver in charge of all the branch houses.

Trade Treatises.

The Cyclone Drill Co., of Orrville, Ohio, has issued a circular describing their hand-power core drill.

The C. A. Bartlett & Snow Co., of Cleveland, Ohio, have issued Bulletin No. 17, descriptive of their rotary driers, and Bulletin No. 18 on conveying machinery.

Power & Mining Machinery Co., of Cudahy, Wis., have issued Catalogue No. 4, describing rock-crushing machinery, with many excellent halftone engravings and line drawings.

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EDITORIAL.

AS stated in our last issue, the offices of this journal are now at Berkeley, where we have secured an excellent suite of rooms in the First National Bank building, a new five-story steel structure of the best type, which went through the recent severe test without a mark. In an adjoining building is the Standard Publishing Company, with whom we have made arrangements for printing. The linotype machines and the Miehle presses, together with other mechanical appliances, are all of the best; and in addition to this equipment, we have secured the cooperation of the public-spirited gentlemen who control the establishment.

IT was a merciful coincidence that among the few structures which did not succumb either to the earthquake or to the sequel of fire, were the Mint and the Post-office. The millions of currency stored in the first will be a prime factor in re-establishing financial conditions, while the preservation of the mail service will promote organization. As the disaster came at dawn, there was not much mail in the boxes and chutes, they having been cleared before midnight; moreover, the earliness of the hour saved the incoming mail, which was on the trains.

A few hours after the earthquake, we telegraphed to the authors of contributions that were lost when our office in San Francisco was demolished. By reason of their prompt response, we received copies of many of the articles within the week following the disaster. This is one of the advantages of the modern use of the type-writer. Formerly, authors had to trust to the preservation of their original copy, so that fires consumed a vast amount of valuable manuscript of which no duplicate had been preserved elsewhere.

THE value of a self-contained machine or complete unit is strikingly proved by the timely service given by the motor car during the conflagration. It is true there is many a wrecked automobile now lying in the streets of the ruined city, but the accident or damage that brought the activity of the machine to an end, did not take place until it had served a beneficient purpose, with wonderful efficiency. In removing wounded, in carrying doctors, in bringing dynamite for the blasting operations, in transporting food and, last of all, in aiding the escape of the terrified people, the motor car was of immense service. It was the only means of rapid locomotion.

"IT is an ill wind that blows no one good." There is evidence forthcoming from the conflagration in San Francisco, such as will stimulate the demand for copper. Our friends who are engaged in mining the red metal will be interested to know that the offices in the Kohl building, one of the best, and in many respects the most modern in construction, or all the larger structures in San Francisco, was protected by copper. The doors, casings and bases, all the interior finish of the offices, together with window-sashes, are covered with sheet copper. The people who have offices in that building, above the sixth floor, have found their papers intact. This use of copper is comparatively recent and the evidence just quoted should do much to encourage the innovation.

IT is our privilege to publish several special articles dealing with recent occurrences. That on 'The Cause and Nature of Earthquakes' is by Mr. G. K. Gilbert, of the United States Geological Survey, and a scientific authority second to none. Mr. A. O. Leuschner, who describes the seismograph records, is director of the observatory at the University of California. A suggestive article on 'Some Lessons from the Earthquake' is by Mr. S. B. Christy, professor of mining and metallurgy in the University of California. He needs no introduction to our readers. Finally, we are enabled to publish authoritative details concerning the Commission appointed by the Governor of the State to gather evidence dealing with recent events, and we give an account of the proceedings at the two first sessions of the Commission. The contributions by our own staff will also be found interesting.

THE first shock of the earthquake, as recorded by the Ewing seismograph at the observatory of the University of California, occurred at 5:12:38 on Wednesday morning, April 18. The earth wave traveled in a direction south-southeast to north-northwest. The principal shock came in two movements of maximum intensity, and it lasted two minutes. In violence, this earthquake far exceeded both that of 1868 and 1898. In each case the earth wave traveled in the same general direction. After the first great shock, several minor ones were felt. These came at 5.13, 5.25, 5.42, 5.59, 6.10, 6.27, 6.43, 6.47, 8.10, 8.15, 11.06 and 12.04. Those that were felt soon after eight o'clock were strong and were accompanied by a distinct rumbling noise. In the afternoon several shocks occurred at longer intervals and at 7.1 there was one, sharp and short, but enough to terrify people who were sitting at their evening meal after a long day of anxiety. At 3.17 on the 25th there was a tremor that caused discomfort to those members of our staff who, by that time, were busily occupied in preparing this issue for the press.

OAKLAND, being just across the Bay from San Francisco, and being peopled with a lot of generous folk, has received an immense crowd of refugees. The streets remind one of Cripple Creek or Leadville in the days of a boom, save that horsemen and rowdies are absent. An air of activity, and even of up-building, is given by the scaffolding and other temporary timbered structures necessary in making repairs to chimneys and to buildings that suffered from the earthquake. The tangle of wires and the accumulation of brick that marked the catastrophe were soon straightened or made to look tidy. By reason of the total destruction of every composing room and printing establishment in San Francisco, the daily papers all had to trespass on the courtesy of their contemporaries in Oakland, and as a consequence the number and frequency of special editions hawked by a multitude of small boys, gave Oakland the appearance of a town given up to a big political convention. Whatever the outward appearances, and they varied from grave to gay, from that which was tragic to that which was only amusing, there was, out of sight, in many hundred homes, a wondrous wealth of humanity and kindness that will long remain one of the compensating memories of a terrible event.

WE tender most sincere thanks to our advertisers for their valued support in promptly forwarding us new cuts and copy. The response to our telegraphic requests has been splendid and the episode will knit closer friendly relations as only misfortune, when shared and survived, can do. It is our hope to exhibit practical appreciation of this support, given when most needed, by making the MINING AND SCIENTIFIC PRESS a better paper than it has ever been; and the belief that this can be done is strengthened immensely by the fact that the members of our staff united to do their duty at a time when the sense of personal loss and discomfort was keen. It is a saying among the fraternity that a good mine must go through the baptism of a law-suit; few rich mining properties have escaped litigation in some form. Assuredly it is true that those who work together in an enterprise such as this journal, become united in purpose by such an experience as the recent unpleasantness, in a manner not to be effected even by a life-time of ordinary association.

IN regard to the relation between volcanoes and earthquakes, it is necessary to distinguish between those usually minor but frequent tremors, that are a part of eruptive activity and those occurrences which take place at a long distance from volcanic centers and are related to them only remotely by reason of both being manifestations of structural change within the crust of the earth. The volcano nearest to San Francisco that has been active during the human period is probably a cinder cone situated about ten miles from Lassen Peak in northern California, 170 miles from San Francisco. The forest that was buried by the scoria is still in evidence and it is estimated that the eruption took place within the last 300 years. Other extinct volcanoes are those of Mt. Shasta and several in the Kings River district. In the Mohave desert there are several perfectly preserved cones, and while they were active recently, from a geological standpoint, they became extinct in the beginning of human history.

DESPITE the effort of the Mexican authorities to stifle the truth concerning conditions in the Yaqui country, it is evident, from a letter that we publish on another page, that this part of Sonora is best avoided by mining men who do not care about prospecting the last hole of all. Our correspondent writes as one who is no tenderfoot, but, on the contrary, is familiar with mining in Mexico, and he does not give expression to such strong statements without full warrant for them. The news, last week, of the murder of Samuel Williams, the assayer of the Giroux Consolidated Mining Company, and two other members of the same party, comes as an unpleasant corroboration. The Mexican Government has slowly won the goodwill and respect of the United States, and it is hardly

to be believed that conditions such as exist in Sonora will be permitted to continue without investigation, followed by correction. In the meanwhile, the authorities on this side of the line will do well to attend to their duties. There is a pass 40 miles west of Nogales through which guns and ammunition find their way freely into the lawless region on the other side of the line. If one mentions the matter to a citizen of Tucson, he lifts his eyes to heaven with ingenuous astonishment. But such innocence is not in keeping with the air of the border, and it should not prevent an inquiry into a nefarious traffic, which is at the bottom of the atrocities that have disgraced the State of Sonora and discredited the government of Mexico.

AS seen from Berkeley, twelve miles across the Bay, the burning of San Francisco presented a succession of appearances. Within half an hour after the earthquake shock, a hump of dark smoke appeared over the City, growing during the succeeding hours until it rose through the quiet air like the clouds made by a volcano. When night came, the whole front of San Francisco was ablaze, the flames shooting upward at particular centers with the glowing discharge of a blast furnace; the light of the conflagration illumined the heavy clouds of smoke with a pink glow and the occasional rumble of a dynamite explosion gave the picture a suggestion of warfare. The next day (April 19) the clouds of smoke rolled skyward to a height of two miles, their lower layers dark, but the topmost billows sunlit and splendid. As evening came, a wind from the southwest blew the smoke over the Bay toward Mt. Tamalpais; the sun, like a red ball, threw a crimson light over the waters and there was more suggestion of horror than at any time. That night the big wooden houses in the residence portion were burning luridly, so that the flames rose high to heaven and glowing clouds pierced a starlit sky; the sight was one of desolating splendor. On the day following (April 20) the fire had pretty well exhausted itself and a dark murk of drifting smoke hid the ruins of the proud city of the Argonauts. But it was a quiet clear day, one of California's best; the sun that had set in a mist red as blood rose resplendent and full of life-giving promise. Already with the unconquered energy of a people that has developed a continent, the inhabitants began to talk of the re-building that was to give them another and a more beautiful San Francisco.

WE are profoundly grateful to our friends who by word, by letter and by deed, came to our support during a time of trial. The response to the telegraphic request for articles and material for publication has been such as to prove abundantly the faith we had in the innate generosity of our people. The pages of the Mining and Scientific Press during succeeding issues will demonstrate who helped and how effectively each one did it, by sending contributions of unusual interest. The editorial department rarely has dealings with the advertisers, but during the period of stress that followed the great conflagration, we were brought into closer touch with our clients on the business side of this enterprise, and it remains but to say that the evidence has been simply to prove, what we knew already, that men of the highest character and culture are now engaged in that essentially modern field of industrial activity which is termed advertising. Among so many proofs of generosity, we yet venture to single out one message as typical of a breadth of spirit that does honor to the name of American. Mr. G. W. Fuller, who represents the Cameron Pump, said to our New York manager: "We want our bills to run on just the same as if nothing had happened, even if you do not get out a paper for three months. We appreciate your effort in your advertiser's behalf and whatever you publish, if it has the single word 'Cameron' in it, will be fully satisfactory to us for months to come." We are reminded of a story told by Dr. Holland, chief of the Carnegie Museum at Pittsburg. On a certain pleasant occasion he informed us that the white hippopotamus was rare; in fact, there were only nine specimens in existence and one more, making the tenth, had been consigned to him and was then on the way from Africa. Well, we can state emphatically that 'white' men are not so scarce as white hippopotami, and as long as there are plenty of them, this Earth of ours will be a planet pleasant for residence purposes, despite such minor interruptions as are termed earthquakes.

It is fitting that we say a few words concerning the city that has given us shelter and a temporary place of business. At the beginning of the year Berkeley was a place of 40,000 inhabitants, the center of its life being the State University, whose beautiful oak glades and sloping lawns reach from the post-office to the foot of the Contra Costa hills. The group of buildings, of which three are of recent construction and one—the mining building—not yet finished, were uninjured by the earthquake and still stand in quiet repose facing the Golden Gate. Berkeley has always been a place of homes, beginning with the professors, instructors and students of the University itself, and followed by a number of professional and business men who had offices across the Bay in San Francisco. The facilities for going from the home to the office have been much improved during recent years, there being a double service, namely, the old suburban train and ferry service of the Southern Pacific Railroad and the new trolley line and ferries of the Key route. The convenience of living in a beautiful town situated on rising ground, overlooking the Bay, led to a great increase in the number of residents as soon as access to the City became easy. Now, of course, there will be a rapid accession in population and much of the business of San Francisco will take root here. Some of this will return to its former site when the City is re-built, but some of it will remain at Berkeley. While the Southern Pacific and the Santa Fe railroads both pass through the lower part of the town, the former has no station and the latter one that is not much used, but it is certain that recent events will lead to an immediate improvement in this regard. The accompanying map shows the position of the cities that have grown up around the Bay of San Francisco. At the beginning of 1906 the metropolis had a population of 400,000; Oakland came next with 90,000; Berkeley, 40,000; and Alameda, 20,000. Los Angeles, in the southern part of the State, has a population of 200,000, so that Berkeley is the fourth in size. It was named after Bishop Berkeley, to whom is credited the saying: "Westward the path of Empire takes its way." It was Charles Kingsley, in 'Westward Ho' who originated the saying, but whoever said it, the town of Berkeley is one of those that fulfilled it

The Earthquake

An experience such as that undergone a few hours ago by those who dwell on the shores of the Bay of San Francisco is apt to emphasize the fact that the earth we live on is still undergoing structural readjustment. At such times—or a little afterward, when chimneys have ceased falling and we have gathered wits somewhat perturbed by the unfamiliar sensations—we realize why the Greeks looked upon the Earth as a sentient being; the philosophers of the ancient world dwelt beside the Mediterranean, which from time immemorial has been the theatre of earthquakes, volcanoes and other manifestations of terrestrial unrest. It needs less poetry than fright to suggest the idea that like a giant disturbed old Earth is shaking himself awake, growling the while. As we write, at Berkeley, nearly four hours afterward, the clock, shaken to a standstill, marks 5.14 as the moment of the most severe shock. Across the Bay huge clouds of smoke, sunlit at the top like a splendid cumulus, indicate that San Francisco is afire. As we conjecture what may have happened there come two short shocks accompanied by a rumble; the tremor, but not the sound, being such as would be caused by a blast in a stope three or four hundred feet underground. A mine-blast makes a click, not a rumble, when heard at a distance. Meanwhile, like a severely critical building-inspector, Mr. Earthquake has broken every poorly constructed chimney and in our neighborhood the brick towers of a public institution have been shaken, one tower tumbling to the ground, while another has collapsed. People talk excitedly and compare experiences, the birds chatter in a flurried way and there is a general air of tension. But the sunlight is steady and warm, as if old Sol was too far away to be bothered by happenings on such a minor planet as ours.

Earthquakes may happen anywhere, they are not necessarily connected with volcanic eruptions and they are not confined to rocks of any particular age or character. It is true, however, that the agitation takes the form of waves the amplitude of which is increased when transmitted through yielding rock. Thus the Charleston disaster, in 1886, was intensified by the fact that the Southern city stands upon sand and other deposits soft enough to propagate vibrations. Several observers at Charleston watched waves as much as a foot high run across the surface, and these were met by another series going in an opposite direction, making complex movements which tended to loosen first one wall of a building and then another. Of 14,000 chimneys, not one hundred remained intact, but the number of fatalities was small, although the damage to property was estimated at five to six million dollars. But the worst catastrophe of the kind was that which befell Lisbon on November 1, 1755. This remains one of the great horrors of history. For several years preceding, the volcanoes of the Mediterranean had broken out with unusual violence and earthquakes had passed throughout Europe, without serious effect. Early in 1755 they became more frequent and on the night of October 31, Lisbon felt a slight shock. The next morning three severe vibrations were felt, the first of which lasted only six seconds but quite long enough to throw down practically every building in the city; Lisbon became a stone quarry. Shortly afterward there came a great sea wave and as it rolled toward the land, a huge fissure opened along the sea-front, engulfing a new marble dock which happened to be crowded with people who had rushed from under the falling houses to secure safety. They, the quay, and the boats moored to it all disappeared from view; the bottom of the bay was traversed by a chasm which closed over them, leaving no vestige behind. At a later date, soundings were made and these proved that there was 600 feet of water where once the quay had stood. Fires broke out in the city and destroyed what was left of it. It is estimated that 50,000 perished.

Charleston and Lisbon are occurrences concerning which we have reliable data, but the old records tell of many such catastrophes throughout human history. Antioch, though an inland city, has been the scene of an extraordinary repetition of earthquakes, the first recorded being that of 148 B.C. and the last in 1822. No place is immune from them and though they are common in volcanic regions, they may happen—possibly, from a different cause—in localities far removed from evident terrestrial disturbance.

To the miner they serve as an object lesson to bring home the fact that the faults and other ruptures which he sees underground, breaking his vein or dislocating his pay-streak, are due to causes which have not entirely ceased to exist. The earth is still proceeding through its cycle of change, and if the outward and visible signs of unrest appear to be infrequent, it is only because the duration of a man's life is so brief when compared to the time occupied in producing these geological effects, that he is apt to be unaware of them. The shocks felt by us today probably register a break in the earth's crust at some point—geologically—not far distant and the numerous minor tremors indicate a readjustment after the first break, which may be the culmination of a long period of strain among the strata above which our homes happen to be built. The earth in cooling is steadily shrinking and, like the skin of a dried apple, the outer rocky crust is contorted to the point of cracking, as it gradually adapts itself to a smaller interior. As the thickness of rock is ruptured, one side dropping relatively to the other, there is a shock which pulses through the overlying strata and reaches the surface in the form of earth-waves that prove too much for the structures built by man on the assumption of perpetual stability.

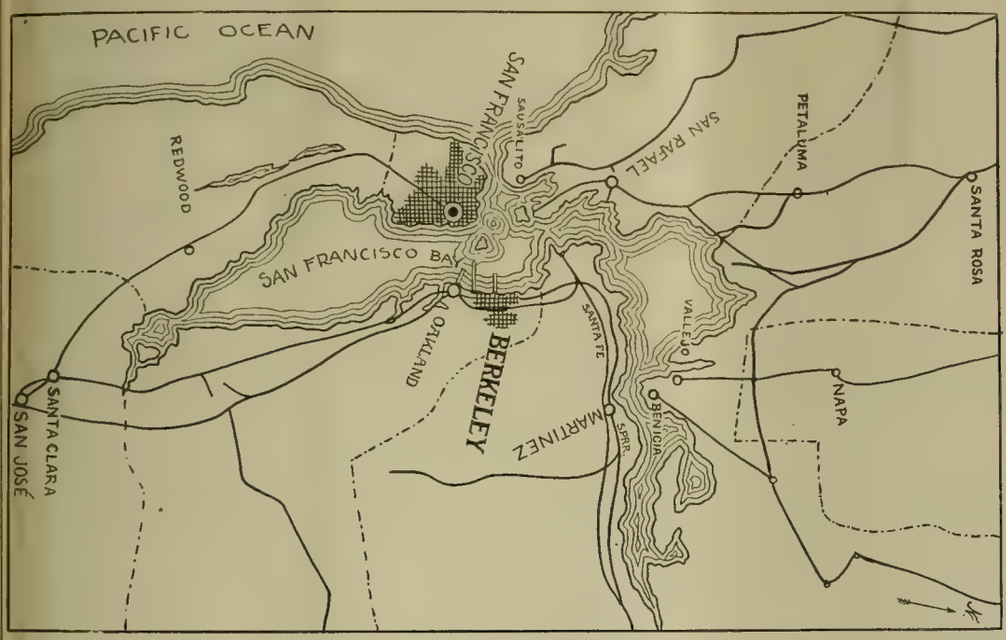
No part of the earth is safe from earthquakes; the place most free from tremors may be the scene of a shock the more severe for having a cumulative energy. The cause of these is only surmised, as due to a rupture within the crust, but the effects have been investigated and the movements measured so well as to indicate the center of the earth pulsation to be far beneath the surface. In the Charleston case, the shocks came from eight and twelve miles deep.

While volcanoes and earthquakes are manifestations that probably have a common origin in this shifting of the rocky integument of the planet we inhabit, it does not appear that earthquakes are necessarily and immediately associated with eruptive activity. The disasters at Charleston, in 1886; in the Mississippi Valley, between 1810 and 1813; at Antioch, on many occasions; and even at Lisbon, in 1755, all occurred at places several hundred miles distant from any volcanic vent. The active volcanoes nearest to San Francisco are those in Alaska.

In volcanic countries—in Central America, in New Zealand and in southern Europe—earth tremors are so frequent that the inhabitants have grown accustomed to them. The 'tremblors' preceding and accompanying a volcanic eruption take place at a comparatively shallow depth and they can be better diagnosed. An upwelling mass of lava, on reaching the ground-water, will provoke shocks, because the molten rock turns the water into super-heated steam, which expands with explosive violence when it penetrates cavities under-

ground; moreover the emanation of lava through a vent—frequently the crater of a volcano—will eventually leave a cavernous space which by the collapse of the overlying rock produces a settlement of the surface accompanied by vibrations, much in the same way, though on a different scale, as when the hanging wall of a stope falls in.

The relation between water and volcanic eruptions is one that is variously explained. The fact that volcances are found either near the sea or actually rising



THE BAY OF SAN FRANCISCO.

through the ocean floor, led to the theory that eruptive action is due to the penetration of sea water into cracks communicating with the molten rock, which, either as a sub-stratum or in isolated reservoirs, exists underneath the cold crust of the earth. The water was supposed to undergo tremendous expansion leading to violent escape, through vents which afterward allowed of an exit for the lava itself. But the best geological opinion holds nowadays that the volcanoes made the water, just as much as the water the volcanoes. The ocean marks an area of sedimentation, over which the detritus, worn away from the land and carried down by the rivers, is deposited. This accumulation of sediment proceeds until the thickness of material is measured by miles and until the pressure on the lower layers becomes so intense as to force out the water imprisoned in them. This water was carried down with the particles of sand and silt as they fell to the ocean floor and constitutes one-twentieth to one-fifth of the consolidated material. The successive layers present an impervious structure to the direct ascent of the water when it comes within the deep zone of high pressure and high temperature, so that an outlet is sought along the edge of the area of sedimentation, namely, along the rim of the oceanic basins. Hence centers of eruption become established along the coast.

The above notes dealing with the geologic causes underlying earthquakes, were written before there was any knowledge of the conflagration that was to destroy San Francisco. As the train and ferry service stopped early that morning, the writer employed the time of anxious waiting to prepare some notes, not anticipating any such catastrophe as supervened. The earthquake itself, which was destructive enough to all save wooden houses or a few of the most scientifically-built steel structures in the City, was also a cause for terror at Berkeley, but it damaged seriously only a few buildings. The vibration seemed to lessen eastward, so that Berkeley felt it less than Oakland, and Oakland less than the City itself or the minor towns on the San Francisco peninsula. In the redwood frame dwellings at Berkeley, one woke up suddenly on that fateful Wednesday morning to find the house shaking, amid violent creaking and cracking, so loud as to drown the crash of falling chimneys. Recognizing that it was an earthquake, one expected it to cease every moment, but after a movement of less violence, the horrible shaking began again, with greater intensity, until it seemed that the house must collapse bodily. To those who were unwilling observers of the phenomenon, it seemed as if the house were being shaken much as a terrier shakes a rat, with a final wrench that promised to make an end—but it was succeeded by a gradual decrease of the vibration. This feeling of a wrench, that is, of torsional strain, was emphasized in some of the taller buildings and it was due probably to the crossing of two sets of vibrations. In regard to other evidence, it is too early to collect accurate data. In San Francisco the street-car tracks on Market street retained their alignment fairly well, but the roadway was depressed fully four feet. Market street is paved with cobbles; where there was an asphalt pavement in the lower parts of the town below Montgomery street, the roadway was buckled so as to make tents, and in other spots there were depressions several feet below the normal level. Southward, along the San Francisco peninsula, the shock was particularly severe and, it is stated, actual fissures, five to seven feet wide, traversed the surface of the ground. Palo Alto felt this and, in consequence, the buildings of Stanford University succumbed. When a scientific investigation is made, as it should be made, either by the State or the proper department of the National Government, it will be found, we believe, that one fact stands out prominently, namely, that the earthquake was destructive in the City mainly from Montgomery street down—eastward—to the water-front. This area is 'made land'; the original shore followed an irregular line that coincides roughly with Montgomery street. By means of piles and filling, the City has encroached upon the shallows of the Bay. Visitors to San Francisco will have noticed how irregular was the level of the side-walk along the lower part of Market street; the pedestrian found the pavement three or four feet higher in front of one building than it was in front of the next. This was due to the City ordinance whereby the side-walk had been raised (to be followed later by a similar elevation of the level of the roadway) so as to secure greater depth for sewers, until they were below the basement floors. Many supposed that these irregularities marked the subsidence of the older buildings, but it was not so, as explained. There was plenty of evidence, however, among the older and poorly constructed buildings, of subsidence, but the irregular side-walk was no part of this testimony. The structures erected on plank were, in several cases, out of the perpendicular and others had sunk, while those built properly on piles were allright. The original fill was made of all sorts of stuff that was deposited to a depth of about ten feet upon the blue mud of the Bay, under which there is a layer of gray sand, seven to eight feet thick and very tenacious. This is succeeded by more mud. The piles not reaching hard-pan are gripped by such material so that in many cases it would be difficult to budge them with a two-ton hammer a month after driving. In the best practice, piles 70 feet long are used wherever hard-pan cannot be reached; this means a depth of 75 to 80 feet below the street, because it is necessary to get below the level of the tide. After the sea-wall of the new ferry building was made, the ground tended to shift less and it seemed that eventually it would become stationary, for the wall hindered the tide in penetrating the filling and placed an obstacle to creeping. The sea-wall made tidal action sluggish within this 'made land', and this did not affect the piles which still remained under water, but it did permit the plank to dry and therefore to rot, so that buildings on plank foundations have been sinking during recent years. This part of San Francisco felt the earthquake severely and in this respect the evidence agrees with that of Charleston. Similarly—although here the distance from the center of disturbance may be a factor—the lower alluvial flats of Oakland and Berkeley were seriously disturbed, while the parts of those cities that spread over the solid ground at the base of the Contra Costa hills felt the shock only slightly. It is apparent that the earth-wave caused by the rupture far below the surface, is propagated intensely in sand, alluvium, filling, made ground, or any other unfirm material. Build your house on a rock—or as near it as convenient—and if you find it necessary to live or to do business on yielding ground, see to it that the best engineering skill is employed, to the end that any natural obstacles may be surmounted by the application of scientific knowledge in construction.

FIRST NATIONAL BANK BUILDING, BERKELEY. OUR PRESENT QUARTERS.

Since the above was written we have been favored with Professor Leuschner's description of the records obtained by the seismograph. He also was prevented from going to the City on that Wednesday morning, although his anxiety to do so can be measured by the

fact that his wife was there, having been to the opera the night before and remaining with relatives until the next day. During the interval, before he could offer help to those on the other side, as he did most effectively later in the day, this scientific man busied himself with collecting data and making observations on the phenomena connected with the earthquake. It is interesting to note his quotation from the report on the earthquake of 1868. This, of course, we had not seen, when we made the remarks in a preceding paragraph and similarly Mr. Leuschner knew nothing of the damage done to buildings upon the filling below Montgomery street when he also referred to the danger incurred by structures erected on ground of this nature. There is room for comment here on the short memories of humankind. Here was an authority—E. S. Holden—who reported on the last serious earthquake forty years ago, and emphasized the danger of building "on the made land between Montgomery street and the Bay." Nevertheless, during the years since that report was published, people have continued to build there in disregard of the evidence that it was dangerous to do so without taking proper precautions. We emphasize these last four words, because as yet the evidence all goes to show that the greatest damage was done to buildings badly built or constructed on designs that ignored the principles of sound engineering. The amount of dishonest construction that escapes undetected in a big city is appalling and it is this that the earthquake, like a relentless inspector, exposes.

In this way the calamitous effects are a visitation or punishment for wrong-doing and if only those who were responsible were punished, there would be nothing to say. Speaking of a catastrophe such as this as a punishment, reminds one that in days gone-by the earthquake and conflagration that have destroyed San Francisco would have been hailed as an act of God. designed to wipe out a wicked and sinful community. While our people may be in a contrite mind and far from haughty at this time of disaster, they look upon the event as due to natural causes, the scientific reason for which they surmise vaguely. It is extraordinary to notice how much an elementary knowledge of geology has spread and how such knowledge has prevented the prevalence of superstitious fear or hysteric collapse. Whatever views people may hold regarding the general direction of the affairs of this Universe, even the most orthodox nowadays impute an earthquake to natural causes and this fact gives them a courage in adversity such as the ignorant and superstitious can rarely possess. Meanwhile, whatever little knowledge men may possess concerning the methods of the Great Architect of the Universe, is not incompatible with gratitude for preservation from a great peril and with hope for the future.

The Earthquake Commission

The Governor of California, with the approval of the National Government, has appointed a commission to make a scientific enquiry into the effects of the recent occurrence. The commission includes A. C Lawson and A. O. Leuschner of the University of California, G. K. Gilbert and Fielding Reid of the U. S. Geological Survey, John C. Branner of Stanford University, George Davidson, Charles Burkhalter and W. W. Campbell.

The commission met at the University of California on April 24. Professor A. C. Lawson was elected Chairman, and Professor A. O. Leuschner, Secretary. After a general discussion of the scope of the work to be undertaken, it was decided, in view of the alarming reports which had been circulated, to issue a statement to the effect:

1. That the times of earthquakes cannot be predicted, and that any predictions such as have been current during the last few days are unwarranted.

2. That severe earthquakes are generally followed by a number of minor shocks extending over several days or even weeks.

3. That the physiographic conditions in the Bay region are such as to preclude any serious damage from earthquake waves, popularly called tidal waves.

At its session next day, the commission prepared the following request for the transmission to it of any observations made by those who happened to be within the area of disturbance:

It is of importance that the citizens of the state of California co-operate with the State Earthquake Commission in its investigation of the recent seismic disturbance. For this purpose it is essential that the Commission receive, as soon as possible, information on any or all of the topics outlined below. All communications should be addressed to the State Earthquake Commission, University of California, Berkeley, California.

Give information on the following:

1. Post Office address; town, county, and State.

2. Place and date of observation.

3. Name and address of the observer, if other than the writer.

4. Give estimate of the intensity of the earthquake on the Rossi-Forel Scale. The Rossi-Forel Scale as amended by the Commission is as follows:

I. **Perceptible** only by delicate instruments.

II. **Very slight** shocks noticed by few persons at rest.

III. **Slight shock,** of which duration and direction was noted by a number of persons.

IV. **Moderate shock,** reported by persons in motion; shaking of movable objects; cracking of ceilings.

V. **Smart shock** generally felt; furniture shaken; some clocks stopped; some sleepers awakened.

VI. **Severe shock,** general awakening of sleepers; stopping of clocks; some window glass broken.

VII. **Violent shock,** overturning of loose objects; falling of plaster; striking of church bells; some chimneys fall.

VIII. Fall of chimneys; cracks in the walls of buildings.

IX. Partial or total destruction of some buildings.

X. Great disasters; overturning of rocks; fissures in the surface of the earth; mountain slides.

5. Give any facts that you can as to the directions the Earthquake Waves seemed to travel. Describe the character of the shock, whether a tremblor or an oscillatory motion, etc., and whether you yourself or others had any clear impression as to the direction in which it was moving, the facts on which this impression was based and whether people agreed as to the direction.

6. Give also any further particulars of interest, whether they are from observation or hearsay. If any changes occurred in the ground, such as depressions or elevations of the surface, fissures, emissions of sand or water, describe them fully. Character of damage to buildings. General direction in which walls, chimneys and columns in cemeteries were overthrown. Springs, wells and rivers are often notably affected, even by slight shocks, and any information in regard to such changes will be valuable.

7. State as exactly as possible the **time of commencement** and the **duration** of each shock.

The exact time of the beginning of a shock (to the nearest second), one of the most important of all observations, is difficult to get correctly, because of the great velocity with which the wave travels, and because the watch or clock must be immediately compared with a clock known to be keeping standard time. If several hours have elapsed before the comparing is made, another comparison should be made an hour later, in order to find whether your timepiece is gaining or losing. The observation cannot be regarded as a good one, unless it is stated that this has been done. Telegraph operators, railroad officials, watchmakers, etc., have especially good opportunities for answering this question correctly, and their cooperation is most earnestly solicited.

If a clock was stopped, give the exact time it indicated (and anything known, as how fast or how slow it was), its position, the direction in which it was facing, and the length of the pendulum.

8. If the shock was not felt in your neighborhood, although noticed at places not very far distant, do not fail to answer the first four questions, as negative reports are of great interest in defining the limits of the disturbed area, etc. State also the nearest point to your station where the shock was felt.

9. Name of writer.

Note.—In replying to these questions, they need not be repeated; but the answers should be **numbered** to correspond to the questions.

[We trust that any of our readers that can help the cause of science and the safety of our people, by transmitting such data as are requested by the Commission, will do so at once, while their memory is fresh. Editor.]

Many tests have been made to ascertain the conditions under which mixtures of air and fire damp become inflammable or explosive. Mixtures of fire damp and air, which are not ignitable by an open light, often ignite or become explosive on addition of a little coal dust, and mixtures which will not ignite on application of a flame of small intensity will do so when a flame of strong intensity is applied to them.—Compressed Air.

The Cause and Nature of Earthquakes

Written for the MINING AND SCIENTIFIC PRESS by G. K. GILBERT.

The scientific study of earthquakes has made great progress in the last few decades. On one hand there is substantial agreement among geologists as to the ways in which they originate, and on the other there is agreement among physicists as to the nature of the vibrations.

Earthquakes have two general sources. One group, known as tectonic are by-products of the subterranean forces and processes which make mountains and elevate and depress portions of the earth's surface. The other group, known as volcanic, are by-products of the movement of lavas from below upward. The tectonic are far the more numerous, and include all the important earthquakes that have been recorded in the United States.

In the formation of mountains and other great features of the earth, the rock masses are forced into new shapes. They are pulled, pushed, twisted and bent; so that strata, for example, which were originally flat, become inclined and curved. If the changes are sufficiently slow, the component particles of the rock readjust themselves gradually; but if the changes are comparatively rapid, the rocks are broken. Before fracture occurs there is elastic yielding, or 'strain'; that is, the rock is compressed or stretched or bent somewhat like a spring; and when its strength is at last overcome the dissevered parts recoil. This recoil is instantaneous, violent and powerful, and is of the nature of a jar. The jar is communicated to the surrounding rock, and is passed on from particle to particle in all directions. Each particle is moved from its original position and returns again, thus making an oscillation. Some conception of what takes place may be derived from the dropping of a pebble on the smooth surface of a pond. A wave is started which travels outward over the surface in all directions, so that at any instant it has the form of a circle. The motion within the earth is also called a wave—an elastic wave—but it travels up and down as well as horizontally and its form at any instant, instead of being circular, is spherical. Wherever this expanding sphere reaches the surface of the earth, there is an earthquake.

Volcanic earthquakes also are the surface manifestations of elastic waves, and many of them originate in the breaking of rock masses, but the initial jar is also given by explosions, and sometimes by the falling in of cavern roofs.

The fracture producing a tectonic earthquake may be a mere parting of the rock, but usually there is slipping along the fracture, constituting a fault. Some of the faults making earthquakes are visible at the surface. The Inyo county earthquake in 1872 was associated with a dislocation of several feet which can still be seen along the western margin of Owens valley. The greater number of fractures are not visible, but occur miles below the surface. The depth of the origin of the Charleston earthquake was estimated at 12 miles.

The fracture may be horizontal, or vertical or inclined, straight or curved. It may be miles in extent. It is not all made in the same instant but progressively, so that seconds or minutes may be consumed. The initial jar is thus distributed through space and time, with the result that the earthquake involves a very complicated movement. Some of the remoter readjustments appear also to consume much time, so that minor fractures take place at intervals after the main fracture—or, at least, that seems a rational interpretation of the fact that an important earthquake is followed by a long series of minor shocks ard tremors.

An earthquake is complex in yet another way. Elastic waves are of two kinds. In one kind the to-and-fro movement of the particles agrees in direction with the progress of the wave; in the other kind the particles move in a direction at right angles to the direction of wave progress. Every earth fracture starts both longitudinal and transverse waves, and the two kinds are started together, but it happens that they travel at different rates, so that at a distance from the origin a single initial jar may be represented by two distinct shocks. The behavior of the two waves is also qualified in an important way by the material traversed. The longitudinal wave may be transmitted by both solids and fluids, the transverse by elastic solids only. When a transverse wave encounters loose, incoherent material, such as sand, and especially when it meets wet alluvium, it is transformed into a wave of a different character, analogous to the surface waves of a body of water. It becomes visible as a surface undulation, its rate of progress is reduced, and its amplitude, or the

space through which the particle moves is greatly increased. It is for this reason that earthquakes are peculiarly destructive on alluvial lands.

Some Lessons From the Earthquake

Written for the MINING AND SCIENTIFIC PRESS by S. B. CHRISTY.

San Francisco, dear to the miners of '49, has been destroyed by fire many times before, but each time has sprung again to life more vigorous and beautiful than ever.

San Francisco, dear to the miners of today, has just passed through a new baptism of fire, but already she is shaking herself free from the ashes that cover her and will again hold the proud place she has won for herself more strongly, more grandly than ever. There is no fear for her future. The most permanent of human institutions are the great commercial centers. These are marked by Nature herself and nothing but the destruction of her noble harbor can prevent San Francisco from remaining the natural gateway for the commerce of the Pacific.

BERKELEY AS SEEN FROM THE HILLS, LOOKING TOWARD SAN FRANCISCO.

As the fires die out and the smoke clears away, some lessons of this great event stand out so boldly that it behooves us to profit by them for the future. In the first place, it is certain that with good foundations good designs and honest workmanship, the earthquake damage in San Francisco would have been as it was in Berkeley, merely nominal. It was poor design and construction that caused the losses. Buildings that stood on a sound foundation and were wisely planned and honestly constructed were practically unscathed by the earthquake. At the University of California, which stood upon the solid ground of the Berkeley hills, the seismograph showed an earth movement of about half an inch. But although actual records are missing there is no doubt that in alluvial soil, loose wet sand, mud, and other loose materials such as covered the lower parts of San Francisco, the earth motion was greater and probably of a different nature from the vibrations in solid rock. Nevertheless there stand in San Francisco, on made land along the water-front, a number of buildings upon deep pile foundations that suffered very little from the earthquake. There is no doubt that the modern steel-frame construction, when properly placed on a sufficient foundation and wisely planned and honestly built, is practically safe from earthquake shocks.

San Francisco contained a number of old fashioned structures, many hurriedly and cheaply built on insecure foundations; these were known to be unsafe and should have been condemned long ago. I saw many "concrete foundations" that had a shell of cement half an inch thick on the outside that were filled inside with loose sand. It is no wonder these gave way and undermined the structures they did not support. The earthquake was a stern exposer of sham and it ruthlessly searched out the work of ignorance, cupidity and graft. The City Hall had long been known as such a structure and it was seriously injured by the shock. But at the University of California, at Berkeley, the California Hall, and the Hearst Memorial Mining Building, designed and erected by the University architect, Mr. John Galen Howard, came out without a blemish. The total damage to all the buildings of the University of California (chiefly chimneys) can be covered by the sum of five hundred dollars.

In San Francisco the wide-spread ruin came from the fire. This too can be avoided in the future, if the lessons of this disaster are wisely utilized. Some of these causes of disaster exist in all modern towns and the like may happen anywhere. Modern cities are too much centralized; just as was the case in San Francisco. The electric power and light, the water and gas services were all at once disorganized. Telephone and telegraph lines failed to work at the time they were needed most. Numerous stations for wireless telegraphy should be established by every large city to meet just such contingencies.

The paralysis of the power plants stopped street-car service, both cable and electric, while the old horse-cars would still have been effective. The automobile service during the fire proved to be of incalculable value. With street-cars idle, telephones down, the automobiles went everywhere. They carried messages, wounded, supplies, dynamite—anything with certainty and dispatch.

The shoddy construction of the cheap flats and tenement houses south of Market street started fires all over this territory; and as the water supply was centralized, an accident to a part crippled the whole. As it was impossible to fight fire without water, the fire spread more and more until it had eaten up three-fourths of the city. The wreck of the water supply was another example of the excessive centralization of modern cities. Many square miles of buildings were destroyed simply because they depended on the general water supply which failed; but the United States Mint, though surrounded by fire, was saved, partly because it was honestly constructed, but also because it had its own artesian well for fire protection and an independent steam-pumping plant. If all other large buildings had been similarly equipped, the fire might easily have been checked.

In the absence of water, dynamite was resorted to. This was very effectively used by the army engineers, but many others who handled it, did not know how to apply it effectively and only spread the fire. Often when it was used, it was employed too timidly and was resorted to when it was too late. If the blocks in Chinatown between Kearny and Stockton had been promptly blown down Wednesday afternoon the entire residence district of the Western Addition might have been saved. A hundred California miners used to handling dynamite could have saved three-fourths of the burned district by intelligent and prompt blasting.

It was fortunate that the military and naval posts were so near, so numerous, and so efficient. The value of military discipline in an emergency was never more strongly demonstrated. It is difficult to imagine what would have happened in San Francisco during the dreadful nights that followed the fire, if it had not been for the presence of the regular troops. With a firm hand anarchy was suppressed every time it showed its head. Many a family owes its safety to the boys in blue. The militia and the cadets of the University of California also rendered very valuable service in protecting the lives and property of the citizens of San Francisco, Oakland and Berkeley. What these bodies lacked in experience was more than made good by superior intelligence and good-will. The University boys, under the able leadership of Captain Nance of the regular army, were hailed with cheers by the people as they marched to their stations, and petitions were circulated among the residents to protest against their removal when they were called back to Berkeley.

It would be a fatal mistake to rebuild on the old plan. San Francisco has a site of rare beauty. The Seven Hills of Rome are no more picturesque than hers. But the ugly streets which ascend the steep hillsides should be replaced by streets that closely follow the contours, on an easy grade, and the higher portion of the city should be laid out in terraces. The lower and flatter portion should be laid out in fire-districts covering not more than 160 acres each. These fire districts should be separated from each other by broad boulevards fully as wide as Van Ness avenue; and at each corner of every fire-district should be a park covering at least one block; so that at the corners of each of these fire-

districts there would be a park four blocks in area, serving as breathing places under ordinary conditions and as places of refuge in times of conflagration.

The space under the sidewalks should be no longer encroached upon by property owners, but should be open to tunnel-ways belonging to the city, for the reception of sewer, water and gas pipes, and for electric power and telephone lines, and should be under the control of the city government. This would make possible the constant inspection, repair, and a maintenance of these important arteries of the city's life, and would facilitate the easy distribution of power to the various residence and business centers; and would avoid forever the constant tearing up of the streets which has caused the destruction of the sewer and water lines by the earthquake.

Each fire-district should have its own independent source of water and power, so that its total destruction could not cripple the rest of the city. In the flatter portions devoted to business and manufacturing interests there exists an adequate supply of water easily reached for fire protection by artesian wells, and each large building should be forced to provide itself with such a supply, with proper fire service worked by an independent steam-pumping plant that would be available in cases of general conflagration. In the fire-districts and the hilly portions of the land there should be reservoirs always kept full of sea-water which can be easily supplied by properly distributed pumping stations. This could be utilized for flushing the sewers, for bathing as well as fire protection. These systems of water supply should be independent of the supply of drinking water.

The police, the military, and the fire departments ought to organize an efficient automobile service with numerous garage stations, supplied with small supplies of gasoline, which, with other inflammable substances, should be kept in underground chambers.

San Francisco should appoint a competent commission of architects and engineers to study, with the greatest care, the effects of the earthquake and the fire upon buildings having different types of foundations and modes of construction. This should be done at once, and a prompt and thorough investigation should be published immediately for the use of those who are intending to rebuild the new city, and the most stringent laws should be passed controlling the types of construction that shall go up in the new San Francisco. Every large building should be supplied with an underground vault similar to those of the banks for the protection of records and plans. Blue-prints of all the power lines, pipe lines, and sewers ought to be stored in such fire-proof vaults in more than one place. The wisdom of this procedure is demonstrated by the fact that such copies as were on file in the University Library at Berkeley have proved of great service. The value of large areas of park land, such as Golden Gate Park, the Panhandle, and the Presidio, has been clearly demonstrated. These areas should be increased rather than diminished. The Burnham plans certainly ought to be made the basis of the new city, although some changes may possibly now be made with advantage which were not possible before the fire.

These measures are absolutely necessary for the safety from destruction by fire, and while it might not be possible to condemn property for public use for the purpose of beautifying the city, it certainly is justifiable to do so as a measure of public safety, and it ought to be done intelligently and promptly. The success of a properly devised system of assessment of damages and benefits resulting from such changes was clearly shown at Baltimore. No city ever had an opportunity so great as San Francisco has at the present moment for utilizing the ideas of modern science and engineering skill.

No one who shared the terrors and uncertainties of the dreadful days and nights of the fire can have failed to be impressed by the noble courage of the men and women who suffered from the disaster. They met the dangers and accepted the losses with a courage worthy of the descendants of the men of '49. No one who witnessed these scenes can have any doubt as to the great future of San Francisco.

For fast cutting in drilling, the straight chisel-edged bit is recommended. This style of bit must be carefully tempered, as the cutting is mostly done by the sharp corners, which are likely to be chopped off if there is the slightest flaw. The hammer blows should be sharp and quick. In hard rock a somewhat rounded and rather blunt bit is more economical, though it will not, perhaps, cut so fast.

The Earthquake

Contributed to the MINING AND SCIENTIFIC PRESS by A. O. LEUSCHNER.

Students' Observatory, University of California, April 18, 1906.

An earthquake eclipsing in severity even that of October 21, 1868, occurred in San Francisco and the surrounding region early this morning. The earthquake came suddenly, without preliminary vibrations. The intensity of the first shock put the sensitive Ewing seismograph, of the Students' Observatory of the University of California at Berkeley, out of action, but a fairly complete record was obtained with the duplex instrument, of which the following is a preliminary account. The best record of the beginning of the heaviest shocks is furnished by the Standard clock of the Observatory which stopped at 5 hours, 12 minutes, 38 seconds Pacific Standard Time, while less severe shocks were recorded by Mr. S. Albrecht some 35 seconds earlier. The principal part of the earthquake came in two sections, the first series of vibrations lasting for about 40 seconds. The vibrations diminished considerably during the following ten seconds and then continued with renewed vigor for about 25 seconds more. But even at this writing, about 12 M., the disturbance has not as yet subsided, as slight shocks are being recorded at frequent intervals on the Ewing seismograph, which has been restored to working order. The principal direction of motion was from SSE to NNW. The remarkable feature of this earthquake, aside from its intensity, was its rotary motion. As seen from the record, the sum total of all displacements represents a very regular ellipse and some of the lines representing the earth's motion can be traced along the whole circumference.

The three severest earthquakes on record in this vicinity are those of October 21, 1868; March 30, 1898, and that of today. From their records an important conclusion may be drawn, which may be of value in constructing buildings in the future so as to guard as far as possible against destruction. The result of observation indicates that our heaviest shocks are in the direction SSE to NNW. In that respect the records of the three heaviest earthquakes agree entirely. But they have several other features in common. One of these is that while the displacements are large, the vibration period is comparatively slow, amounting to about one second in the last two big earthquakes. If today's shocks, as felt at Berkeley, had been instantaneous, inestimably more havoc would have been wrought among all kinds of buildings. The slowness of the vibration is the only redeeming feature in these calamities. The following account of the earthquake of October 21, 1868, as experienced in San Francisco, is taken from Professor E. S. Holden's 'Catalogue of Earthquakes, 1769 to 1897', and will serve to show the features it had in common with that of today. "The first shock was 7 h. 53½ m. A. M. Its direction was northerly and southerly. Its duration was 42 seconds. The second shock came at 9:23 A. M., lasting five seconds. Lighter and briefer tremors occurred at intervals of about half an hour, till 12.15 P.M. The first shock was most severely felt on the eastern side of the City, on the made land between Montgomery street and the Bay. On the solid land no serious damage was done to any well-constructed house. The Custom House was badly damaged. It was poorly constructed. As in 1865, a small crevasse was opened on Howard street, beyond Sixth. The greatest damage was done in a belt several hundred feet wide, running northwest and southeast, commencing at the Custom House and ending at the Folsom street wharf. The tall chimney of the United States Mint was damaged. The ferry steamer Contra Costa was near Angel Island and felt the shock strongly. Shocks were noted at 7.53; 8.10; 8.15; 8.45; 9.20; 9.30; 9.35; 10; 10.30; 11.05 A.M., and 2.58 P.M. Waves came 15 to 20 ft. further inland than usual. There were about thirty casualties in the 150,000 inhabitants. Five deaths occurred from falling walls, etc. Not a single well-built house on the solid land suffered materially, whether of brick, stone, or wood. Wooden houses suffered least."

By following the trace of the pen on the record, it can be seen that the first large motion of the earth was due west. It measures two inches. As the instrument multiplies 4.3 times, the actual displacement of the earth's crust or amplitude of the wave, was about one-half inch. This also corresponds to the average amplitude of the resultants in the direction SSE and NNW. Taking the average period as one second, the velocity of the earth-wave during the heavy shocks is found to be roughly two inches per second, by far the greatest ever observed on the Coast. Heavy masses on fairly smooth surfaces were observed to move as much as three inches. The times of the several shocks were carefully noted by Mr. Albrecht, Fellow in the Lick Observatory, now at the University as a graduate student of astronomy, until 9 hr. 26 m. A.M. After that records were taken by Dr. Crawford and Mr. Einarson with the Ewing seismograph. The last shocks recorded are mainly from east to west. Observers throughout California are requested to send their records to the Students' Observatory. The vertical component of the shocks was also of great intensity but of less frequency. The maximum shock measured in a vertical direction being 0.8 inch.

From Old Friends

NEW YORK, April 19, 1906.

Dear Mr. Rickard:

Your former associates on the staff of the Engineering and Mining Journal hear with deep regret of your probable loss through the catastrophe in San Francisco. We are without particulars as yet, but trust that the loss may not be so severe as our present information would indicate. In any event, we wish to express our sincerest sympathy, and to say that, if there is anything we can do at this distance to assist you, we will gladly render what service we can.

We hope also to hear that your home in Berkeley escaped, and that your family is well and uninjured.

Yours sincerely,

F. HOBART. R. McKEAN.
CHAS. S. PALMER. LILA L. DAWSON.
EDWARD K. JUDD. FRANK McHALE.
W. R. COCHRANE.

NEW YORK, April 19, 1905.

Dear Rickard:

You have my sympathy in this terrible calamity. hope your interests escaped without loss, but I fear not. Is there anything I can do to help? If so, call on me for any assistance that is in my power.

Yours sincerely,
W. R. INGALLS, Editor.

Friends in Need

The following interchange of telegrams speaks for itself:

1. DENVER, Colo., April 20, 1906.

T. A. Rickard, Berkeley, California.

You have our deepest sympathy in the fearful catastrophe that has befallen you. We offer to you all our facilities. We will reproduce your advertising pages of last week, edit and print ready for mail by the time you can get mailing list and instructions to Moore.

MINING REPORTER.

12:30 P. M. Delayed in transmission.

BERKELEY, Calif., April 23, 1906.

The Mining Reporter, Denver, Colorado.

Your friendly offer is cordially appreciated and will not be forgotten. We have made arrangements for our next issue. T. A. RICKARD.

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2. DENVER, Colo., April 20, 1906.

T. A. Rickard, Berkeley, California.

Accept our sympathy, good wishes and command us if our plant or any part thereof will be of use to you.

THE DAILY MINING RECORD.

4:35 A. M. Delayed in transmission.

BERKELEY, Calif., April 25, 1906.

The Daily Mining Record, Denver, Colorado.

Your kind offer of help is keenly appreciated. We have made arrangements.

T. A. RICKARD.

The following letter has also been received:

Dear Mr. Rickard:

I wish to tender my sympathy, as well as that of my colleagues on 'The Mining World', for the great loss you have suffered from the appalling disaster in San Francisco. In a spirit of friendship we offer you our services, and hope you will not hesitate to solicit the help of a contemporary, 'The Mining World,' to rehabilitate the Mining and Scientific Press which has so long catered to the intellectual development of the mineral industry.

Assuring you again of our good will, and trusting courage will aid you to re-build on the ruins of a once beautiful city, we remain.

Yours very truly,
'The Mining World,'
G. S. SCOTT, Pres.

First Observations of the Catastrophe

Written for the MINING AND SCIENTIFIC PRESS by D'ARCY WEATHERBE.

These notes were made on Saturday, April 21. One who felt the shock in Berkeley at 5:15 a. m.—saw the results throughout Berkeley and Oakland between 8 a. m. and 3 p. m.; spent from 4 p. m. until 8 p. m. within the fire area and the business section of the doomed city of San Francisco on the first day of the disaster, and on the third traversed the wastes from the ferry to St. Mary's College on the Mission road, and from there to the water front end of Van Ness avenue, and back through the burned district to the ferry, should at least be aware of the prevailing conditions, in however poor a mood for description his experience might leave him. Not even the pen of a Zola could properly describe the impression received and stamped in a lasting manner on the mind of anyone of the odd half million people residing in the vicinity of San Francisco Bay on that fatal morning of April 18, 1906. In meager mechanical words, the general effects were a terror that left the recipient in a hopeless, mentally numbed state, followed by a physical nausea, the causes of which are akin to sea-sickness. It appears, too, that a common impression was that the end of the world had come. The reaction naturally was severe. The immediate and complete annihilation of the city by fire and the ensuing panic and consequent wild flight of the inhabitants in every direction was succeeded, as might be anticipated, by cases of starvation, together with looting, violence and demoniacal deeds perpetrated by the half crazed or debauched portion of a cosmopolitan community. Many instances of plundering the dead, wilful incendiarism, persistent selling of liquor, and violence to women were summarily punished by shooting on the spot, and in most instances the punishment was well deserved at such a crisis, though the example to some of the youths in soldier's clothes was bad, particularly as many of these were under the influence of liquor.

Men who are appointed to judge on the spot whether a fellow man merits death and then to act as summary executioner should be specially selected, and it is doubtful whether it were not better to altogether forego such method of punishment than to have law-abiding and respectable citizens butchered on the streets, as has been the case in San Francisco.

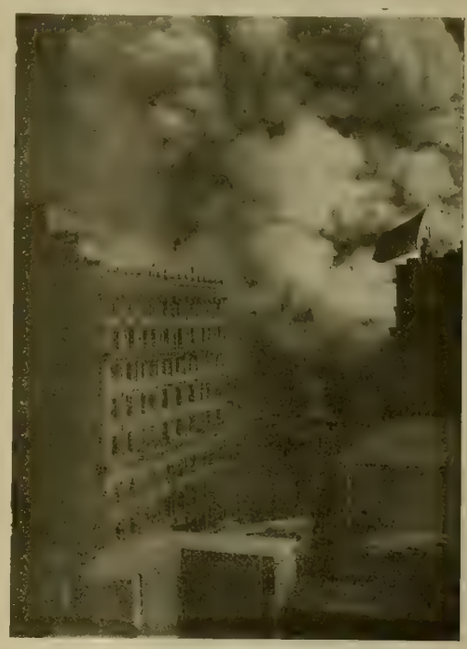
Scenes pitiful or ghastly were the rule at hundreds of points through the blazing city. The fire, which commenced south of Market street, near the water front, gained rapid headway and, almost unhindered by the helpless firemen, who were without water to combat the flames, it passed up town, licking up everything in its way, all the magnificent business structures, one by one succumbing to its fury. At the St. Francis hotel the main rotunda was crowded with the guests, who sat in the dusky twilight (no lights being available) with their hand baggage between their knees and waiting for they knew not what. This magnificent hostelry, which was thought, however, to be comparatively safe, was, seven hours later, completely gutted, the guests fleeing for their lives. With incredible swiftness the conflagration traversed the business portion of the city and seized with greedy tongues of flame upon the handsome residential and the other thickly populated districts. Governed only by the wind, it reached Van Ness avenue late on Thursday and followed north from Market street along the east side of Van Ness. Crossing this beautiful avenue, it wiped out a block on the west side and then, reluctant to give up its prey, turned northeast to meet the other fire which had previously devastated Nob, Telegraph and Russian Hills in its path northwestward toward the Golden Gate. Thus the entire area bounded by Market, Van Ness and the bay is laid waste; on the south side of the main artery—Market street—the devastated ground is roughly bounded by Dolores street on the west and by an irregular line following from about the corner of Dolores and Twentieth streets, down Twentieth to Kansas, and thence across to Twenty-fifth street and easterly by that street to the bay, and on the north by the water front.

The streets of Chinatown, which we passed through, were thronged by fully 3,000 Mongolians of all castes and ages. Some of the older men and women looked more like leprous animals than human beings, and many had probably not been out of their over-crowded dens for years. Their squalid effects, piled in every conceivable shape, impeded progress through the narrow streets, and passing through their district toward dusk we hastened our steps ferryward, traversing that disreputable locality known as the Barbary Coast. Here beasts in human shape in every stage of drunkenness, and delirious from stolen liquor taken from the wrecked saloons, shouted or sang in a perfect pandemonium. Within a few blocks the roar of the flames, the noises of constantly falling walls, and the dynamiting supplied a sufficiently hellish accompaniment to that orgy.

Refugees from the densely populated Mission district fled along the Mission road toward San Mateo, and the sights on this highway on Friday, the 20th, are never to be forgotten. An endless procession had left the city on Wednesday and Thursday with carts, buggies, motor cars and vehicles of every possible description, including hand carts and wheel barrows. Part of the throng camped wearily in the fields on the outskirts of the city, while others kept on toward the southern towns. On the fire burning itself out in this direction some of the refugees returned, and the scene on Friday morning was pitiful in the extreme. Under a blazing sky, the heat of the sun being intensified by the pall of smoke that hung over the city to the east, were seen old men and women helplessly and aimlessly carrying bundles hither and thither. Children with fevered faces and women with babes in arms, trudged through the dust, which lay nearly a foot deep on the road, and was raised in blinding clouds by the passing of wagons; this intensified a thirst already strong by reason of the unnatural conditions. Fortunately, water in this, as in most of the outlying suburbs, became available in reasonable amount, though even this was carefully husbanded. The fearful contingencies that may arise in these enforced camps are famine and disease, the latter spreading quickly on account of the necessarily unsanitary state of affairs. Similar conditions are the case at the Golden Gate Park and the Presidio, though here more facilities are provided for the comfort of the homeless people. In the streets bricks from the ruined structures are everywhere piled in the form of ovens, and meals are being cooked in the open. Crowds surround the occasional relief wagons that have gained access to the city. Flour is received from the cart in hats, in hands or in any available utensil, and is quickly converted into flapjacks or partially cooked dough. In the poorer districts the fact must be emphasized that more kindness and less greed were displayed than in those which could better afford generosity. In the Mission district almost every small grocery or food shop gave away gratis its entire stock. Even then an armed guard was necessary to preserve order. Men and women, with hands outstretched, thankfully took whatever was offered—tinned stuff of all kinds, meat, vegetables and fruit, and even bottles of sauce were thankfully received.

The handling of the conflagration by the fire department, the police and the military was probably, on the whole, fairly well done, though being from the first without water, it was a hopeless proposition. That it took as long as it did (five square miles laid practically flat in three days) was due entirely to the favorable condition of the atmosphere, which at first was without wind, and at a critical time changed so as to turn the flames back partly over the already consumed area. Dynamiting, unless done under skilful direction and carried out with experienced assistance, is practically useless and should be strongly condemned. Some of the methods used in the San Francisco fire did certainly not display either experience or even good judgment. In the district covered by frame houses from 75 to 150 lb of 40 or 50% powder was used. It was generally carried in bulk into the lowest floor of the building, placed in the center and set off with a foot and a half of fuse, taking about one minute to burn; the effect, in the cases that I witnessed, was almost entirely lateral, allowing the ruin to fall upon itself. So far so good. Fire in several cases started from the explosion, and it should have been carefully followed up by the little water available to prevent fire. Moreover, the strip to be dynamited in each case should have been decided upon long before the fire reached it, so that when the flames arrived a more or less barren patch would be presented. As it was, a handful of independent men without any head waited until the flames were within one or more buildings before exploding the edifice, the flying debris in some cases actually taking fire in the air. Several blocks were lost that might have been saved by taking the precaution to examine the contents of the building before blasting. In one case noted it contained explosives and spread the fire. It is, of course, easy for any one to criticize, though not so easy for the same people to have done better. My criticisms are meant in a friendly way. Moreover, we have no precedents of such magnitude as to serve for an example. It was, however, apparent to almost everybody that there was want of organization and system in the city. On the contrary, at Berkeley, the energy and systematized ar-

THE RUINS OF SAN FRANCISCO.



PALACE HOTEL BURNING.

rangements for relief will long stand as a shining example of prompt "first aid to the injured." Many lessons are to be drawn from the disaster and particularly from the effects of shock and fire on structures designed and built to resist both. It cannot be said that tall buildings will not resist shock if well built, for we have the case of the Chronicle and Call buildings. On the contrary, the Monadnock building, also a steel structure, though lower and of large base in comparison, was badly wrecked by the shock. However, the shearing strain on rivets and bolts must have been enormous, and it is probable even had there been no fire it would have been necessary to take down the majority of the large buildings for safety, even though apparently uninjured—as seen from the outside. However that may be, it is early to draw conclusions, and it is hoped that the subject may be gone into thoroughly and used as a text for some useful expressions of opinion.

Temporary Addresses of San Francisco Firms

BOSQUI, F. L., Ross, Cal.
BERTRAM HUNT, 750, 59th St., Oakland.
PACIFIC TANK CO., 518 Eleventh St., Oakland.
CHAS. C. MOORE & CO., 417, 14th St., Oakland.
HOLMES, GEO. L., 143 Santa Clara Ave., Oakland.
NATIONAL WOOD PIPE CO., 518, 11th St., Oakland.
UNION GAS ENGINE CO., 23rd Ave., East Oakland.
W. T. GARRATT CO., 2398 Broadway, San Francisco.
BOESCH LAMP CO., 1569 Grove St., San Francisco.
PRICE, GEO. W. PUMP CO., 105 Eighth St., Oakland.
PELTON WATER WHEEL CO., 1259 Alice St., Oakland.
CHROME STEEL WORKS, 1736 Walnut St., Berkeley.
BAKER & HAMILTON, 2701 Pavific Ave., San Francisco.
NATIONAL WOOD PIPE CO., 518 Eleventh St., Oakland.
REDWOOD MANUFACTURERS CO., 564 9th St., Oakland.
GOODYEAR RUBBER CO., 443 Fillmore St., San Francisco.
HARRON, RICKARD & McCONE, 2nd & Clay St., Oakland.
DEERE IMPLEMENT CO., 131 to 153 Kansas St., San Francisco.
HEALDS BUSINESS COLLEGE, 1451 Franklin St., San Francisco.
A. VAN DER NAILLEN, 5000 Telegraph Ave., Oakland. Alden P. O.
ALLIS-CHALMERS CO., care of E. B. & L. Stone. Broadway, Oakland.
JOSHUA HENDY MACHINE WORKS, 2323 Jackson St., San Francisco.
PARAFFINE PAINT CO., 405 to 403 Union Savings Bank Bdg., Oakland.
BYRON JACKSON MACHINE WORKS, 18 Telegraph Ave., Oakland.
DEWEY, STRONG & CO., 10 Bacon Block, 12th & Washington St., Oakland.
MOORE & SCOTT IRON WORKS, 405 Union Savings Bank Bldg., Oakland.
GEORGE E. DOW PUMPING ENGINE CO., 3116 Washington St., San Francisco.
WESTINGHOUSE ELECTRIC & MANUFACTURING CO., 1115 Broadway, Oakland.
CALIFORNIA HYDRAULIC ENGINEERING & SUPPLY CO., care of C. U. Martin, 1169 Jefferson St., Oakland.

A Good Gasket.—A very serviceable gasket may be made easily and cheaply by the following method: Ordinary heavy Manila wrapping paper should be cut out to the shape of the cylinder end by the ordinary method of cutting gaskets. This paper should then be soaked in boiled linseed oil for a few minutes and then have manganese dioxide applied to it with a paint brush, the linseed oil mixing with the manganese dioxide forms a black paint over the surface. The gasket should then be put on while wet and will form an exceedingly durable and efficient gasket for the cylinders of steam engines or air compressors.

AMONG the many creditable actions to be recorded is that of Baverstock & Staples, assayers at Los Angeles, who offer to make assays in behalf of their fellow-practitioners, the remittance in payment for this work to be credited to the San Francisco assayer who would have made the assays if his establishment had survived.

Personals

Henry Janin is in London.
E. McCormick is at Waldo, Oregon.
John A. Church is at Mexico City.
R. B. Lamb has returned to Hedley, B. C.
Edward Skewes is now at Sault Ste. Marie, Ontario.
C. L. Whittle. has returned to Boston from Costa Rica.
Edward L. Dufourcq has returned to New York from Peru.
Hal. W. Hardinge is at the Engineers' Club, New York.
Jas. W. Malcolmson is on a visit to London, from El Paso.
John B. Farish, of Denver, left San Francisco on April 16.
Albert R. Ledoux, of New York, is absent on a visit in Europe.
H. F. Poland, representing A. C. Burrage, of Boston, is at Butte.
Louis Janin has resigned as trustee of the State Mining Bureau.
O. H. Fairchild is examining mines in northwestern Washington.
W. J. Adams has a temporary office at 2902 Bush St., San Francisco.
H. H. Claudet has reached London, on a visit from Rossland, B. C.
J. Trowbridge Bailey sails on May 3 from New York to go to Brazil.
G. McM. Ross, of Copperopolis, California, is visiting his daughter at Berkeley.
W. L. Nasmyth and J. H. Nasmyth of Victoria, B. C., are in Sierra County, Cal.
T. G. Madgwick is on his way from London to the Orsk goldfield, in Siberia.
Horace A. Morse, president of the Sovereign Gold Mining Co., is at St. Louis.
Forbes Rickard has returned from Sonora, Mexico, and is on his way to Pittsburg.
Lee Glockner, of Cripple Creek, has gone to Wells, Nevada, to examine copper claims.
John M. Beckwith has resigned the management of the Nile Valley Co. and is in London.
Oscar Rohn, manager for the Pittsburg & Montana Co., is recovering from typhoid, at Butte.
Herbert A. Megraw is at the Bellevue Hotel, at High Point, North Carolina, until further notice.
J. J. Bennett, manager of the Kimberly mines, in Washington, has gone to Columbus, Ohio.
G. H. Rotherham, lately of Ymir, B. C., is making cyanide tests at the University of California.
Arthur Laughton has become manager for the Chicago & Mexico Mining Co., at Taxco, Mexico.
Anthony J. McMillan, managing director of Le Roi mine, has returned to Rossland from London.
G. H. Barnhart has ceased operating the Second Relief mine, near Nelson; he is now at Erie, B. C.
H. A. Shipman has gone to Ely, Nevada, on professional business. He will also visit the Tonopah and Goldfield districts before returning to Denver.
T. A. Jaggar, professor of geology in the Massachusetts Institute of Technology, has gone to Naples, to investigate the recent eruption of Vesuvius.

DURING THE EARTHQUAKE AND FIRE.

H. C. Roberts and Charles Butters were both absent, in Mexico.
Bertram Hunt had just returned to San Francisco from a professional trip.
E. W. Stebbins found shelter with his partner, Howard D. Smith, at Berkeley.
Arthur H. Halloran was at Reno, Nevada, at the time of the disaster. He is now at Tonopah.
E. B. Gage, manager of the Tombstone Consolidated, Arizona,, was in San Francisco on April 17.
J. W. Stearns passed through San Francisco on his way to Denver two days before the earthquake.
Austin H. Brown was at the Palace Hotel, on a visit from the Bully Hill mine, at Kennett, Cal.
Christopher R. Corning, of New York, was staying at the Pacific Union Club in San Francisco on April 17.
W. H. Radford lives on Broadway, a long way from the center of the city, therefore his home was uninjured by the fire.
Edward H. Benjamin, who was at 331 Pine St., San Francisco, has already opened an office at 903 Linden St., Oakland.
Albert Burch was in Idaho and he returned to San Francisco on receipt of the bad news. He went to Grass Valley on April 26.
H. P. Garthwaite was at the Palace Hotel, but he escaped with some belongings and is at the house of Charles Butters, at Berkeley.
F. L. Bosqui returned from Goldfield, Nevada, ten days before the event. He and his wife escaped to his father's house at Ross Valley.
George L. Holmes has opened an office temporarily at 143 Santa Clara Ave., Oakland. He has been to Oroville and Folsom this week.
Walter P. Jenney and Jas. W. Neill, who made headquarters at the Palace Hotel, were both absent, one in Nevada and the other in Utah.
H. deC. Richards was at Sacramento when the earthquake came, and he has returned to his quarters at the Cosmos Club, which was not burnt.
Sarat C. Rudra, of Calcutta is stated to have arrived in San Francisco just before the disaster. He had been examining mines in Sierra County, Cal.
Curtis H. Lindley, of 'Lindley on Mines,' lost his valuable library, but he and his family escaped unhurt, to the house of Henry Bratnober, at Oakland.
R. Gilman Brown and wife lived at the St. Dunstan, which was destroyed. They took refuge at the Ingleside Golf Club, on the outskirts of San Francisco.
At Oakland live Alfred von der Ropp, Henry Butters, Charles G. Yale, Arthur Goodall, Herbert Lang, J. R. Scupham, Mark L. Requa, Eugene Braden, Henry Bratnober.
F. W. Bradley and wife, who were living at the Palace hotel, pending the completion of their new house on Pacific Ave., found refuge with Mark L. Requa, at Oakland.
J. F. Halloran was at Washington, D. C., about to go to Europe. He proceeded at once to San Francisco, fearing his property was destroyed. Fortunately his house was outside the fire area.
R. Gilman Brown, Theodore J. Hoover, R. C. Turner and Thos. H. Leggett had offices at 310 Pine St. R. C. Turner had just moved his belongings and was at Tonopah, Nevada, at his new post as superintendent of the Tonopah mine. Thos. H. Leggett was in New York and Theodore J. Hoover in Mexico.
Among those belonging to the mining and metallurgical professions who live at Berkeley, and therefore escaped the worst effects of the disaster, are W. H. Storms, D'Arcy Weatherbe, R. B. Nickerson, P. George Gow, Albert Burch, Charles Butters, F. F. Thomas, F. C. Roberts, M. B. Newcomb, W. R. Thomas, N. C. Stines, W. H. Kett, Howard D. Smith, Alexander Burrell and William Sharwood.
Among those who had offices in San Francisco were: In the Crocker Building; Charles Butters, M. L. Requa. Albert Burch, A. Wartenweiler, H. C. Callahan, C. F. Nourse, Martin J. Heller, W. H. McClintock, F. W. Bradley, J. H. McKenzie, A. H. Ten Broeck, J. S. White, A. Scott, and J. C. Ralston; in the Mills Bdg. were: F. L Bosqui, A. P. Rogers, O. H. Balker, Homer Wilson, William S. Noyes, John M. Wright, and M. J. McDonald; in the Crossley Bdg. was L. C. Trent; in the Merchants' Exchange Bdg. was E. A. Stent; in the Rialto Bdg. were J. C. H. Ferguson, Geo. L. Holmes, O. B. Perry and E. H. Merrill. In the Nevada Block were Janin, Stebbins & Smith; also Ross B. Hoffman.

Oil and Gas in Kansas.—The Independence quadrangle is in the southeastern part of Kansas and includes an important part of the Kansas-Indian Territory oil and gas field. This field has an area of nearly 11,000 square miles and extends from Paola in eastern Kansas southwestward about 200 miles to Muscogee, Indian Territory and Cleveland, Oklahoma. The Independence quadrangle lies near the middle of this great belt. It embraces all of Montgomery county, the southern third of Wilson county and portions of adjoining counties. Its southern edge is the Kansas-Indian Territory boundary, while its eastern edge is approximately 47 miles west of the Kansas-Missouri line. The principal towns are Independence, Coffeyville, Cherryvale, Noedesha, Caney and Elk City. Independence, situated near the center of the quadrangle, is about 140 miles from Kansas City.

HYDROGEN does not unite with as large a number of elements as oxygen. At a higher temperature it displays a strong tendency to unite with oxygen, burning with an almost colorless and very hot flame to form water. This property serves for the identification of hydrogen gas.

IN Mexico a working partner must necessarily devote the whole of his time and attention to the business of the partnership, unless there be an express consent or an agreement to the contrary.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

The slow backward movement of abrupt rock faces due to weathering has been called the 'recession of cliffs,' a name appropriately descriptive of the process.

The slates of the Mariposa beds of the California gold belt have been referred to the Jurassic age owing to the appearance of casts of fossil aucella.

Miners can survey their own claims with considerable accuracy by using a common compass provided with sights and by taking care in making measurements.

Land in California more valuable for granite, limestone, marble or other structural stone, than for agricultural purposes may be located under the mining laws.

When estimating the $500 worth of work necessary to secure patent, any work done by former owners who had abandoned their claim cannot be considered as part of the expenditure.

Quicksilver is obtained on the Pacific coast from four minerals—cinnabar, metacinnabarite, native quicksilver and tiemannite (mercuric selenide). This latter occurs in Piute county, Utah.

The development of a mine is exploration. The stoping and working of a mine after it is developed is exploitation. A good maxim in mining is keep exploration well in advance of exploitation.

A normal fault is one in which the hanging wall has sunk relatively to the foot-wall, and a reverse or thrust fault is one in which the hanging wall side has moved upward relatively to the foot-wall.

The first dividend paid by the Calumet mine, of Michigan, was in August, 1870; the Hecla, then a separate property, paid its first dividend of $5 per share in December, 1869. Since that date these mines have paid in dividends $93,850,000.

Cost of fuel for engines: It will be convenient in estimating the amount of coal for hoisting engines, and the like, to use the following figures: Allow one-third of a ton of coal for each 10-h.p. per 10-hour shift. This rule holds good for most engines up to 80 horsepower.

Do not use laborers to do the work of masons or carpenters, nor should you require skilled workmen to do the work of laborers. A 20-cent man can lift as many pounds of wood or of stone as a 60-cent man. Plan to keep each class of man busy at his particular class of work.

Cylinders of engines and steam-drills are frequently cracked in cold weather by suddenly letting-in steam. To avoid this, open the drip-cocks and the cocks on the steam chest, and blow in steam for a few minutes to heat the cylinder before starting. A broken cylinder may delay work for a week or more.

The discovery of tin has been announced at many places throughout the West in recent years, but few of these reported discoveries are to be taken seriously. Those unfamiliar with tin ores are often led to believe garnet, iron ores and several heavy, dark minerals to be tinstone.

The greatest heat of air in the sun has probably never exceeded 145° F., nor the greatest cold lower than -74° F., at night. About 130° above and 40° below zero are the extremes in the United States east of the Mississippi, and 65° below zero in Montana, all at the common ground level. It is stated, however, that -81° has been observed in northeastern Siberia.

Theoretically a 1000-lb. stamp dropping 6 in. 100 times per minute, crushes 25% more ore than a stamp of 1000 pounds dropping 16 in. 30 times per minute, all other things being equal. It is claimed by those, in Colorado, that use the high, slow drop that the character of the ore demands greater time for amalgamation.

An anticlinal fold is one in which the strata dip in both directions from the crest of a fold. A synclinal fold is one in which the strata dip toward each other from opposite directions. A quaquaversal fold is one in which the strata dip away in all directions from the crest of an uplift. A monoclinal fold is one dipping in one direction only.

When using hanging bolts in shafts, use only large-sized iron washers. There is no economy in small washers. A 4 or 5-inch washer is far better than one 2½ inches in diameter, for should any downward tension exert itself the small washers will sink into the plates and there is sure to be a subsidence in the shaft-sets. Large washers will obviate this to a great extent.

Some of the loss of cyanide that occurs when gold and silver ores are treated by the cyanide process, may be traced to the presence of mineral acids and salts, such as ferrous sulphate and sulphuric acid, and to minerals soluble in cyanide solution. Such salts and acids are called 'cyanicides' or killers of the cyanide. To these must be added a certain percentage of waste in washing the tailing and to the loss by evaporation.

A company operating a mine or a reduction works, no matter how safe the work seems to be, must never neglect insurance of its men if it would secure itself against serious financial injury. There are insurance companies which will agree to assume liability for claims made by a workman or his heirs, except, that when a certain number of men are killed by a single accident, the company will have to stand part of the damages.

The laws of California require that a superintendent or manager of a mining company operating in this State under the laws of California make a weekly official report of the condition of the property, and progress of the work. This weekly report shall be accessible to the stockholders of the company at their principal place of business. Failure to make such report, or the filing of an untruthful report, is a misdemeanor and is a punishable offense.

The Egyptian obelisks are monoliths of great size—some of them nearly 80 ft. in length. That in Central Park, New York, is 68 ft. 5½ in. high, and 7 ft. 10½ in. by 7 ft. 5 in. at the base. A companion to this stands on the bank of the Thames in London. The Egyptian obelisks were usually made nine to ten times as high as they were broad at the base, and the width at the top never less than one-half nor more than three-fourths as great as the base.

Earthquake shocks are rarely felt severely underground, the principal effect being at the surface. The point of origin of the shock may be deep-seated—50 miles or more—but the wave motion is transmitted through the rock-mass without apparently disturbing the rocks until a point is reached near, or at, the surface when the result may be destructive. This is probably on the same principle that several balls may be suspended by strings in a straight line, the balls touching each other. If one of the balls at one end be drawn back, released and allowed to fall against its neighbor, the shock is communicated to each ball in the line successively until the end one is reached, when this will fly outward, the others remaining undisturbed in their position.

When shafts are sunk in rock firm enough to stand without timbering, the shaft may be divided into two or more compartments by means of timbers placed vertically above each other at stated distances, these timbers reaching from wall to wall of the shaft. To these may be secured the guides in vertical or steeply inclined shafts. In some inclined shafts, even these dividing timbers are dispensed with, only plates being placed on the foot-wall side to carry the tracks for skips or buckets, ladders, etc., and only such dividers as are necessary to support air, steam and water pipes.

There is often a vast difference in current reports concerning a mine that is being boomed for what can be made in a stock operation and one which is worked for what profit there is in it. A great deal of free advertising is sometimes given a mine, statements of high values being commonly made, in connection with great breadth of orebodies. During the last few months a large force of men has been reported engaged in development work and have succeeded in sinking a small shaft 60 feet in soft rock. In comparison with this is a gold mine in the Southwest which for months past has shipped large amounts of bullion monthly and yet its name in print is a rarity. These make a decided contrast.

The Court of Appeals of Colorado rendered a decision in a mine patent case, some time ago, in effect, as follows: In consideration of the sinking of a shaft in a mining claim, by certain persons, and obtaining a patent at their own expense, the owner of the claim agreed in writing to convey to them a stated interest in the claim, provided the patent was obtained by a certain date. The shaft was sunk in accordance with the agreement and the miners paid the claim-owner part of the expense of the patent, and notified him that they were ready to proceed in the matter of the patent at any time, but the owner advised delay, saying he would let them know when he would require the balance of the money. The court held that he thereby waived the condition that the patent must be obtained by a certain date, and could claim nothing for non-fulfilment; and also that, as they could not take out the patent, all they had to do was to furnish the money for the patent.

Shaft-timbers may be cheaply and quickly framed by use of templates, which make all framing uniform. Of the several systems or methods of framing shaft-timbers at the corners, the overlap joint is simple and easily made. This overlap is employed in vertical shafts only and is framed by cutting out one-half the thickness each of the wall-plate and end-plate to a width equalling the width of the timber. The upper half of the wall-plate is cut out and the lower half of the end-plate is removed. The wall-plates are first placed in position as nearly as may be, being swung on hanging bolts. When both timbers are on the bolts, a gauge is slipped in at each end, by means of which the timbers are adjusted at the proper distance from each other, when they may be secured in that position by tacking a piece of lagging on top of the plates near each end. The end-plates are then dropped in and the set wedged to place, which is determined by a plumb-line in each corner, suspended from sets above which are known to be in line. The lines should take in not less than three sets in height. If four lines are not used, the sets are likely to be wedged out of line. Lining up sets is a particular job requiring care, patience and good judgment. It pays to do shaft work well, and good enough is only good enough when it can be no better. A slight departure from the true line is scarcely noticeable at first; but, as set after set is put in place with equal carelessness, it soon develops a shaft which is not a credit to anyone. In inclined shafts a dovetailed notch is cut near each end of the wall-plates and a corresponding tenon cut on the end-plate. The timbers are placed in the same manner as explained above. Timbers framed in this way may also be used in vertical shafts. This latter method requires less timber. Where absolute rigidity is required in shaft-sets, it is good practice to put posts at each corner, and in large shafts also at the center, or opposite the dividers. When the shaft is being lagged have the post of the same size as the plates, or, at least, one dimension of the same size. If 10 by 12-inch plates are used, they should be put in with the 12-inch face upward. The posts should be 8 or 10 by 12, the outside faces being placed flush with the outside of the plates. This will make the posts line up with the lagging, and no lagging need be put behind the posts. The amount of timber required is less, and the saving of time is an item of even greater importance.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

THE ASSAY OF CYANIDE SOLUTIONS

The Editor:

Sir —Mr. William Magenau, in your issue of April 14, mentions some modifications in the method of Mr. Alfred Chiddey described in The Engineering and Mining Journal of March 28, 1903. I have used the same method with somewhat different modifications, getting accurate results but consuming a much longer time. The method, as modified, is as follows:

Take 100 c.c. of the solution to be assayed, add 7 c.c. of a 10% lead acetate solution, then add one gram of zinc shavings and place on the hot plate. Heat, but not to boiling, until the lead has gathered around the pieces of zinc. This usually takes about 25 minutes. This precipitation being complete, 20 c.c. concentrated HCl is added and the heating continued until all effervescence has stopped. The lead is then in such a spongy condition, that by the aid of a flattened glass rod, it can be pressed into a cake and the clear solution poured off. Wash the lead twice and then with the fingers press it into a compact mass, drop in a lead-foil funnel, leaving a vent for escape of the steam, place in a hot cupel and proceed as in an ordinary cupellation. This latter operation consumes from 25 to 35 minutes; the lead button is ready for cupellation in about one hour.

I have used this on solutions varying in strength from 0.01% KCN to 0.4% KCN and in value from 0.04 to 3 oz. gold per ton. I have also used it for the assay of silver solutions, but when they are rich the results are lower than those obtained by the evaporation in lead boats.

The secret of keeping the lead from breaking up, is not to allow the solution to come to a boil at any state of the procedure.

NORMAN C. STINES.

Berkeley, Cal., April 23, 1906.

THE TREATMENT OF DESERT ORES

The Editor:

Sir—Referring to Mr. Bosqui's recent article on this subject, athough in the typical oxidized gold ore of the desert regions of Nevada and California the gold is free, it is so extremely fine and flaky that it does not readily amalgamate, but only yields a comparatively small percentage, and treatment by cyanide is necessary. The present fashion of putting in stamp mills and amalgamating arrangements followed by a cyanide annex evidently is due solely to the "compelling power of custom," and not to any proof that this is the best method of treating such ores. To me this looks like attempting to make the ore suit the process, instead of suiting the process to the ore.

The wet crushing followed by cyanidation does not allow the treatment by either amalgamation or cyanide to be done under the best conditions. It often happens, especially when inside amalgamating plates are used, that particles of amalgam become detached and are carried with the pulp to the leaching vats. The gold in this amalgam is not completely recovered in the cyanide treatment, because its solution is very slow indeed. In fact, in practice none of it is got. It can only be recovered after the tailing has been allowed to weather for a sufficient time to oxidize all the mercury to mercuric oxide—this and the gold being readily soluble.

Further, the sand and slime are received in the cyanide department in the worst possible condition for treatment, as they contain a large excess of moisture which has to be displaced by cyanide solution. This occasions a mechanical loss of cyanide and the dissolution of the gold is much slower than if the material had been dry when brought in contact with the cyanide solution.

Many of these ores also contain large amounts of hydrated silicate minerals, such as clay and talc, which have the property of becoming plastic when worked with water, yielding slime which is difficult (and requiring an expensive equipment) to treat. On the other hand in the dry-crushing direct-cyanide method, the material is got in the best condition for treatment by cyanide. As all the interstitial spaces are filled with air, the extraction of the gold is rapid. In the drying also, the hydrated silicate minerals are de-hydrated and lose the property of becoming plastic; therefore the subsequent leaching is much more cheaply and efficiently done. Further, if the ore contains gold too coarse to be dissolved in the time of treatment allowable, the tailing can be easily passed over some amalgamating device and the gold (having been cleaned by the cyanide) will amalgamate readily.

The use of stamp-mills crushing in cyanide solution may be satisfactory in the case of hard clean ores, but with soft oxidized ore, dry crushing is undoubtedly the best. The cost of installation of a dry-crushing direct-cyanide plant is less than that of a stamp-mill and cyanide annex and will be found to yield a higher profit in the majority of cases. As the majority of these oxidized ores give a practically complete extraction by direct cyanide treatment, what is the advantage of using both amalgamation and cyanide to recover the same value? The removal of a portion of the gold as amalgam does not reduce the cost of cyaniding the material appreciably. The consumption of cyanide due to the gold content is negligible.

In many cases these surface desert ores are porous, so that very fine crushing is not needed and a straight leaching plant can be installed at a much smaller cost than a stamp-mill and cyanide annex of the same capacity. These oxidized surface ores are called "free milling," evidently just because they show free gold on panning. This is not correct. A "free milling ore" is one that yields a large proportion of its gold to plain stamp-mill amalgamation. In no instance will these 'free' desert ores yield any large proportion of their gold to amalgamation but in the majority of cases the gold is completely soluble in cyanide.

BERTRAM HUNT.

San Francisco, April 17, 1906.

THE YAQUI COUNTRY

The Editor:

Sir—From the standpoint of a mining engineer who has been into other parts of the Yaqui Territory before, and who has just now ridden over two hundred and thirty miles of country lying in and about the hot-bed of these Indians, and also speaking with the authority of one who has recently discussed the Yaqui question with those in high authority—with prominent citizens of Mexico as well as with the peasantry in the disturbed sections—I am prompted to ask for space in your columns to protest against what, in my opinion, is more ignominious than the scandal that attaches to the question in general; that is, that it should have been possible to circulate a proclamation denying the Yaqui danger, which proclamation is manifestly designed to attribute to bandits such depredations as have been perpetrated, and at the same time intended to minimize the danger of travel in Sonora in respect of possible Yaqui attacks.

It is scarcely to be believed that such a proclamation as was in fact addressed to the Department of Fomento, City of Mexico, that is, to Government headquarters, and found the willing or unwilling signatures, as the case may be, of more than one hundred names, including merchants of Hermosillo, Guaymas and Magdalena, native and foreign alike. These were the names of business men, mine owners, mine managers, mine superintendents, bankers, storekeepers, etc., including even the name of the American consul of at least one of the towns named. I ask the question, does force of circumstances justify this written outrage on public credulity?

Among the names of those who signed this malicious document was that of Don Pedro Meza, presidente of the little mining town of La Dura; he has paid for this the penalty of death, even though he carried an escort of forty soldiers, a fact which in itself gave the lie to the assertion that the Yaqui danger was exaggerated, if it existed at all.

A Los Angeles newspaper of March 26 comes out with an article under the head line, "Story of Massacre Fully Confirmed," and in describing the assassination and butchery of Don Pedro Meza, his wife and three grown girls, Mr. Hoff and his wife, this newspaper indulges in a vivid, distorted and false version of the circumstances of this horrible outrage.

It was my chance to come upon the scene of the ambush two days after its occurrence and to look over, and take photographs of, seven partly burned bodies of the Yaqui dead, which numbered nine altogether, and I saw besides from fifteen to twenty dead horses that marked the direction of the fight. A day later we crossed the trail of this same band of one hundred and fifty Yaquis, who were carrying their wounded, as we knew from a quilt which they had discarded, and from blood stains. The signs at this time were very fresh and indicated, what was corroborated afterwards, that we were very close to the band that had killed Meza and Hoff and their families.

What we saw here, taken in conjunction with the fact that seven men and women traveling in the Meza party were killed and five of Meza's personal servants—constituting his guard—one officer in command and two soldiers of an escort originally forty strong, proclaims only too plainly the horrible truth. No ground is left for dramatic journalism under these circumstances, when the passengers are assassinated and the escort is saved. There is but little doubt that the battle belonged to those who did not survive to tell the story of their brave part in this inglorious episode.

The party with which I was traveling went out under the direction of Mr. George M. Ryall, of New York City, who is a concessionaire of some of the best mining territory contained within the Yaqui zone. It included, in all, five Americans under escort of eighteen rurales and two officers of the rank of lieutenant. In coming upon the scene of the ambush below Otate pass, east of Suaqui Grande, we had followed for two hours the trail of the Yaqui band going in the same direction and had noted the single mule-prints of the animal which was ridden by their chief.

These facts speak for themselves, but that is not enough. I raise my single voice in unwavering protest against the many who in the signing of the shameful proclamation have signed away the lives of tens, and probably hundreds, of men and defenceless women who dare to venture outside the walls of their little towns upon errands that make their travel imperative. It is true that there have been American citizens murdered in ambush; and there will be more to swell the list if they go out into the Yaqui country trusting to the misrepresentations that have been made to the Mexican Government by mining and mercantile interests, and even by their fellow countrymen who have wantonly signed the lying document and cleverly worded death trap that has been so carefully prepared by some of those in authority. If I have the qualifications to enable me to make a statement of the real condition of things as I have seen them, I have also the courage to declare against American citizens who are weak enough to lend their names to such outrageous purposes.

Looking a little closer toward home, there comes an official order from Washington, D. C., according to which American citizens going in and out of the Yaqui infested zone do so at their own risk and peril. I believe that I voice the sentiment of other Americans when I ask, "Is that all the protection the United States citizen is to expect from his Government?" and "Are not these same United States authorities aware that there is virtually no ammunition to be had in the larger towns of the State of Sonora in the region of the Indian trouble?" and further, "Are not the Yaquis getting their rifles and ammunition from Tucson and Nogales and other points about, and north, of the United States frontier?"

In answering such interrogatories our Government will have to admit that there is no restriction placed upon the sale of arms and ammunition to the Yaqui people, and will have to face the fact that our frontier habitations support many Indians who are in constant communication with their fellows in the field. That they are being aided in defense of lands which they claim by right of possession, is poor consolation when one runs the risk of being ambushed at every turn in the road. Many Yaquis are still employed by American interests in mines near the frontier.

The daily importation of ammunition* along the border line, the harboring of Yaquis on the American side, and the employment of Yaqui labor by American interests on the Mexican side, can be verified in each respect by anyone who wishes to inform himself of the Yaqui question, and if he be in the mining profession and he thinks upon the ambush of mining men whom he may have personally known, he may well stop to ponder as to how much the United States Government is doing to protect the lives of its citizens when engaged in developing the mining interests of Sonora before he looks across the line to criticize the Government of a sister Republic. He will find slim consolation either way.

I have talked with the Mexican Government scouts, whose duty it is to post the army authorities on the disposition, movement and numbers of the several

*The Yaqui generally carries the discarded arm of the Mexican army, a 45-90 Remington single-fire rifle, with peep sight; the guns that they are importing are Winchester 30-30's and other modern weapons.

bands of Indians that constitute the Yaqui people to-day. These scouts can, and do, furnish the information required, but in the meantime fatalities are frequently reported in the form of the ambushing of a stage or of a coach party, or of Mexican families, or of the killing of a foreign traveler—sometimes traveling with an escort and sometimes without. It has all happened before and it will happen again. In the course of time it becomes the tearful gossip of a mourning, poverty-stricken people, but the news is never published and information of it is quickly suppressed. The newspapers are under the ban. On the other hand, there is the deserted ranch and houses, roads unused, wells abandoned and cattle left to run wild with two-year-olds unbranded. That is what the traveler will see to-day in going from La Colorado to Tecoripa, to San Javier, to La Dura, to Suaqui Grande and back again. As it is true of this section, it is likely to be equally true of the country in the vicinity, whether it be more infested or less infested, and if there be any reader who questions such description as I have given of the territory within the bounds named, let him go a few miles to the north and northwest, to Cobachi mountain and Mazatan mountain, and he will find something still more interesting.

My final word to professional friends is to advise them to stay out of the Yaqui country until there is some better assurance of security of travel and safety to life than anything that exists to-day, whether going under escort or otherwise.

Under conditions involving so many conflicting statements concerning these Indian troubles, the man who has business that takes him into the Yaqui country has been in the same position as the man who is cautiously watching the questionable maneuvers of a dog that barks and wags his tail at the same time. He is in no position to know which end of the dog to believe. To mining engineers who will take this word of warning I say that the tail of this beast wags deceitfully.

El Paso, Texas, April 11, 1906.

FORBES RICKARD.

BLAST VS. REVERBERATORY FURNACES.

The Editor:

Sir—In reply to the first question, I would say that the choice of furnace should depend on the fineness of the ore to be smelted. Concentrate finer than 16-mesh makes too much flue-dust to be profitably smelted in a blast furnace, and should, therefore, be smelted in reverberatories, after roasting, if they are sulphides and require roasting.

2. In certain localities where coking coal is not obtainable, and inferior light bituminous coal, lignite, or wood are cheap, the reverberatory might be preferable on coarse material.

3. The fluxes necessary might have a strong bearing on the selection of the furnace. Other things being equal, less flux is necessary for a reverberatory furnace running on a silicious charge than is necessary to smelt the same charge in a blast furnace. A reverberatory can get along with less copper than a blast furnace on a silicious charge, while a blast furnace can carry a more basic slag than a reverberatory, and requires less flux, for the reason that a basic slag will cut out the hearth of a silica-lined reverberatory and cause great expense for repairs, which would not be the case with a water-jacketted blast furnace. A reverberatory lined with magnesite brick would not be subject to the same weakness when run on a basic slag, because magnesite brick has a wonderful resisting power to all kinds of corrosives. To give a comparison of the relative value of magnesite, chromite, water-jackets, ground quartzite and clay, I will digress and state the result of some experiments which I have made on these materials.

The matte-tap on the 9-ft. diam. settlers in use at the plant of the Mond Nickel Company in connection with the 44 by 120 in. blast furnaces gave out rapidly, and caused many runaways, with accompanying explosions. It became of great importance to find a tap-jacket that would withstand the action of the stream of 25% copper-nickel matte when tapped into the converters. The water-jacketed tap-jackets, whether made of cast iron, with pipe-coil, or of copper or bronze, were quickly destroyed, and were the cause of explosions that threatened the lives of the furnace-men when making a stop. The stream of matte could not be regulated closely enough, and the converter-charges were irregular in size as a consequence.

I had a block made of chromite with the proper-size hole to tap through, and put it in place of the tap-jacket. It lasted about one week, which was about twice as long as a water-jacket under similar running conditions. Then a similar block was made of magnesite, and it has been in use for two months under a much greater flow of matte, and is apparently as good as when first put in. It will be understood that a settler can be run without any other tap-jacket than a clay breast, if the speed of smelting is regulated so that the radiation from the settler will cause a skull of sufficient thickness to act as a jacket, but if the furnace is driven rapidly by increasing the blast, the conditions are quickly changed, and the matte-tap becomes unmanageable and dangerous. The matte-tap in this case becomes the limiting agent of smelting operations, and while it might appear to be a very small thing to cause a plant to slow down, that is exactly what it did.

Graphite electrodes made by the International Acheson Graphite Company of Niagara Falls were cut into blocks, drilled for tap-hole, and used in place of the chromite blocks; they gave slightly better results. There is, however, a considerable amount of FeO or Fe_2O_3 in all matte, and the oxide acted on the carbon at high temperatures and destroyed the blocks, causing runaways of several tons of matte, with accompanying pyrotechnics and detonations such as the Japs never heard at Port Arthur.

The magnesite tap-jacket therefore has come to stay, and while it may not be a feature of as great importance in copper smelting as it is in our case, on account of the extraordinary corrosive action of nickel mattes on tap-jackets, still it is one that is worth the attention of all furnacemen. Magnesite brick was also used as a dam in the furnace-spout to trap the blast, and the stream of matte and slag has been flowing steadily over it for two months at the rate of 300 tons per day without cutting it out or making it necessary to renew it. This I consider the most severe test that any refractory material can be put to.

Magnesite brick is also employed as lining for softening furnaces used for refining lead, exposed to the action of lead oxide at high temperature, and while I have no information about the result, I am satisfied that they are superior to any other material for any purpose of that nature.

At the Pittsburg and Montana Copper Company's works, near Butte, Mr. W. A. Heywood reports remarkable results in lining copper converters with magnesite brick 9 in. thick, feeding in all the silica necessary for slag formation while the converter is in action. At last accounts, one such lining had been in continuous operation since October 17 1905 and showed no appreciable wear except near the tuyeres, where it had been repaired about once each month. This is the most remarkable result obtained in copper converting, and I proceeded at once to try it on copper-nickel matte and regret to state that the result was a failure, which I ascribe to the presence of the nickel. In copper converting, the entering blast oxidizes sulphur, iron and some copper. The copper oxide is quickly reduced to copper or copper sulphide. The iron oxide unites with silica of the lining to form a fusible slag, which rises away from the tuyeres, and the SO_2 gas escapes from the nose of the converter. When the matte contains nickel, the nickel oxide formed is not reduced in the same way as copper oxide, and there being no silica at the tuyeres (if the lining is magnesite) for the nickel oxide to combine with, it is chilled by the entering blast and closes the tuyere. The result is that the blast will not enter without incessant punching of the tuyeres, and then much more slowly and at higher pressure than is the case with a silica-lined converter on the same grade of matte. The net result was that while we were able to convert some matte with the use of a magnesite lining, the capacity of the plant was so reduced that the experiment was abandoned after a two weeks' trial on twenty-five charges.

4. Returning to the question of the blast furnace as against the reverberatory, I would say that each in its particular sphere is suited to do certain work, and it is bad practice and shows poor judgment to try to make either cover the entire field. For example, suppose the charge is a lead concentrate, the simple fact of it being a concentrate would not justify anyone in trying to smelt this material in a reverberatory, although galena used to be reduced to lead in a crude way in a reverberatory. I think that method has been practically discarded. The comparative cost will depend entirely on local conditions of fuel supply, character of ore, size of furnaces, and the skill and ability of the operatives, and cannot be stated until all of these conditions are known.

The relative cost of installation per ton of furnace capacity would appear to be lower in case of the blast furnace. The reverberatory plant will require more space, probably twice as much, for the same tonnage.

5. This question is too general, and, as above stated, the answer depends on local conditions. The blast furnace will require more power. The reverberatory may, or may not, require more labor, depending on whether the charges are smelted from hot calcine or cold ore, and the fuel question depends on the same conditions.

6. Regarding the comparative amount of capital invested in plants of equal capacity, it is my opinion that for small plants they would be about equal, but for plants of large capacity the blast-furnace plant would cost much less, probably 50% in case of a plant of 1000 tons per day.

7. The limiting necessity regarding fuel with the reverberatory is a long-flaming coal or wood with as little ash as possible; and for the blast furnace, coke that is strong and as low in ash as can be produced out of the coal from which it is made.

8. The comparative slag-loss will depend upon the grade of matte produced, which is a matter capable of regulation. On the same grade of matte the comparative losses should be about equal, but where an effort is made to reduce the coke on the blast furnace and run with high blast, the oxidizing effect in the furnace will produce greater slag-loss than on roasted material smelted in a reverberatory. Dust-loss will be much higher on blast-furnace work, especially if running on fine.

9. Where the slag made is over 40% SiO_2, the reverberatory will give better results, unless the amount of copper and matte is large, which is not usually the case.

10. If the grade of matte is over 50%, and 12 to 15% fuel is used on the blast furnace, the slag will be lower than reverberatory slag on the same grade of matte, due to the reducing action of the coke. If the blast furnace is run on, say 5% of coke with high blast, then I think the reverberatory slag will be lower than that from the blast furnace.

11. Owing to the rapid driving of copper blast furnaces, and the necessity for economy in labor, as well as the general efficiency of mechanical feeding, some form of dumping charges into the furnace is necessary and advisable.

12. I have used only one kind of briquetting plant for fine, and I found it very wasteful and expensive to operate. Successful bricking of fine can only be done under two sets of conditions, either hot and dry weather or cold and dry. At El Paso, fine was first bricked by me in 1888 by bonding with common red clay and sun drying, 10% of clay being used. At Argentine and El Paso, I put in a common pug-mill such as is used in brick-yards, and I made the bricks by hand. At Argentine, they were dried on top of the reverberatory roasters, being taken off with a long-handled shovel by a man on the furnace-wall and handed down to another man, who stacked them in charge barrows. At East Helena, a Chisholm, Boyd & White machine was used, the fine being bonded with milk of lime, which is no use in wet weather unless it is dried on the roasters, as above described. In cold weather the fine stuff becomes simply frozen, and for all purposes I would prefer frozen briquettes to those bonded with lime, because they stand handling better; and after they are in the furnace, they do not make any more dust than the other kind. As lime was always used, I am not able to say what the result would be if it were not used. I think, however, that some bond is necessary to make the briquette hold together until frozen. All the briquetting I have done has been done on material treated for lead, and I have never found it necessary to briquette flue-dust for copper smelting. Simply wetting it and smelting with coarse green ore, gives good results and avoids the expense for plant, and the trouble and expense of operating it.

The difficulty of treating fine in a blast furnace is that you do not treat it, finding most of it in the flue ready for another treatment. It is like the Irishman's flea, being always somewhere else. This is especially true where high blast is used. If, however, the flue-dust is allowed to accumulate during the month until the 25th or later, and then a charge is put on consisting of equal parts of green ore, wet flue-dust and converter slag, with about 11% coke and about 20 oz. blast pressure, it will smelt to a fair grade of matte in our case and not produce more than 20% as much dust as was fed in. Generally speaking, it is not necessary to re-charge flue-dust more than two or three times until it disappears. Possibly, it is smelted. The production of flue-dust is about 1% of the total charge, including coke.

HIRAM W. HIXON.

Victoria Mines, Ontario, March 26, 1906.

The Separation of Gold in Antimony Ores.

Written for the MINING AND SCIENTIFIC PRESS by F. H. MASON.

Some time ago it fell to my lot to attempt to find a process for the separation of the antimony from the gold in an auriferous antimony ore. An idea of the nature of the ore may be obtained from the analysis of a concentrate made from samples broken in different parts of the mine.

Insoluble matter (principally silica with a little slate)	19.90
Antimony as sulphide and oxy-sulphide	30.00
Antimony as native metal	8.99
Lead	3.75
Zinc	0.53
Arsenic	0.21
Iron	7.35
Alumina	2.15
Manganese oxide	1.65
Lime	3.11
Magnesia	0.43
Sulphur	16.33
Carbonic acid	2.86
	97.26

It will be noticed that there is not sufficient sulphur to satisfy the antimony existing as stibnite, lead, zinc, arsenic and iron, so that the balance of the percentage, to make up the hundred, may probably be accounted for by oxygen, a little organic matter (which almost invariably accompanies a concentrate) and, possibly, a little fixed alkali, which was not determined. The concentrate contained 1.566 oz. gold per ton of 2,000 lb. This concentrate was made by Mr. E. P. Brown, of Bridgewater, Nova Scotia. Mr. Brown, in his report upon the concentration test, states that while 90% of the antimony was contained in the concentrate, only 38.4% of the gold was retained; so that it would be necessary for the tailing, which contained $4 in gold and one per cent antimony, to undergo some form of treatment for the recovery of the gold. Mr. Brown expresses the opinion that probably there would be no difficulty in treating the tailing by bromo-cyanide.

The first experiments with the concentrate, consisted of various modifications of cyanidation with the view, if possible, to removing the gold and leaving the antimony for subsequent treatment. Straight cyanide with solutions varying from 0.1 to 1% were tried over periods of from one to five days, the cyanide being brought up to strength from time to time. The ore decomposed the solution rapidly, and practically no extraction was obtained. Mixtures of potassium cyanide and bromo-cyanide were next tried; the bromo-cyanide prevented the decomposition of the solution, but failed to attack the gold to an appreciable degree. The best results obtained were less than a 10% extraction in 24 hours; and to obtain this the concentrate had to be ground to pass a 100-mesh screen.

Some experiments with cyanogen chloride were tried, which were exceedingly interesting, not from a commercial point of view, but because the liquid, after filtering, gave a remarkable cobalt-blue color, which turned to a claret on acidifying. The color remained permanent for days at an ordinary temperature, but on attempting to crystallize the salt by evaporation, the color (whether the alkaline blue or the acid claret) disappeared with precipitation of sulphur. Apparatus for crystallizing in a vacuum was not at hand, so the matter was dropped for the time. The reason for the failure of the bromo-cyanide and chloro-cyanide to attack the gold, was attributed to the presence of metallic antimony, causing re-precipitation. The solution, after 24 hours' contact, did not show serious decomposition and would attack gold leaf actively. Addition of other oxidizing agents, such as hydrogen peroxide and sodium peroxide, to the cyanide solution, failed to make the latter effective in attacking the gold. It is a little doubtful even if a fair percentage of the gold could have been removed by cyanide whether it would have left the antimony in a merchantable form. It was absolutely necessary, in order to get any attack at all by the cyanide, that the ore should be in a very fine state of division; buyers, as a rule, do not want all the ore in the form of fine.

About this time some people arrived in Halifax, from Ontario, who were prepared to make a demonstration of a process they had devised by which they could save all the antimony, gold and sulphur in the ore; and, further, they could recover all the reagents used in the operation. This was a nice, modest claim and so anxious were the owners of the ore to see it in operation that the inventors persuaded them to put up the necessary funds for the demonstration.

A shop was rented and the necessary plant installed; the latter consisted of a row of small wooden vats and a second row of similar vats above them; all the vats were sealed and connected with lead pipes. In these vats the ore was placed, together with hydrochloric acid, and they were heated by steam from a small boiler. The escaping vapors passed through a leaden worm, placed in running water, where they were condensed. It was my duty to investigate the process on behalf of the owners of the ore. Three gentlemen arrived with the outfit; two of them appeared to have duties of a purely financial nature, while the third was introduced to me as the chemical wizard. The wizard shot off a good deal of popular chemistry to a motley crowd who listened eagerly and took in nothing; he was a good talker, and he carried the crowd with him. On an old counter, he had arranged a number of test glasses, in which antimony had been precipitated from its chloride as sulphide, by hydrogen sulphide; as oxy-sulphide, by sodium thiosulphate; as oxy-chloride, by water; as ferrocyanide, by potassium ferrocyanide; and as metal, by old nails. These formed a few of the pigments the wizard could make from the ore.

Wishing to draw the wizard out and at the same time not to appear too critical, I asked a few inane questions; he at once pounced upon his prey and a conversation ensued somewhat after the following:

Q. Do you know anything about chemistry?

A. A little.

Q. Very good. Now that ore is being dissolved in hydrochloric acid, and I can precipitate the antimony as any of these pigments, all of which are very valuable. The gold is left in the residue; having removed the antimony I can get the gold into solution with nitro-hydrochloric acid. Do you understand chemical equations?

A. If they are not too complicated.

Q. Very good. Now take that orange precipitate you see there; how do I get it? Why, I take the sulphureted hydrogen I get, while the ore is being dissolved and with it I precipitate the antimony chloride formed, and thus I get back the whole of the hydrochloric acid, see?

$$Sb_2S_3 + 6HCl = Sb_2Cl_6 + 3H_2S$$

Very good; now

$$Sb_2Cl_6 + 3H_2S = Sb_2S_3 + 6HCl.$$

I am bound to say I was struck with the way the wizard used these equations for his own purpose; both the equations given, as far as they go, are accurate, but unfortunately a chemical equation does not take temperature into consideration, nor does it consider water unless it absolutely undergoes decomposition during the reaction.

The first of the wizard's equations expresses a reaction which takes place with cold concentrated hydrochloric acid or hot medium dilute acid. The second equation expresses a reaction taking place with moderately concentrated cold acid or hot dilute acid with an excess of hydrogen sulphide. Thus the acid obtained from the second equation is powerless without concentration to bring about dissolution of fresh ore.

Unfortunately for the wizard, the ore provided for him to treat had nearly 20% native antimony, and upon this hydrochloric acid had no appreciable action, so that he had to retire from the field of his own accord; otherwise, I verily believe he might have persuaded the owners to erect a plant, notwithstanding my efforts to the contrary; so excellent a talker was my friend the wizard.

But to return to my own experiments. At this time the owners were shipping selected ore to England; by the time transportation, brokerage and treatment charges were paid, this ore only realized about one-fourth its assay-value. Added to this, consideration has to be taken of the fact that it probably required the removal of from six to ten tons of ore to obtain one ton of selected material. The ore shipped ran from 40% to 45% antimony and about $50 in gold. My next experiments were on some of this selected material. It occurred to me that possibly by raining a small amount of metallic antimony through molten sulphide, the gold might leave the sulphide and follow the metallic antimony, and if so, the same metal could be used over and over again on different charges of sulphide until it attained a richness, the degree of which would have to be found by experiment, when it would have to be treated for the gold. To test this theory a quantity of the ore was liquated. The following is the result of the liquation:

Liquated regulus	76.6 per cent
Residue	16.8 " "
Loss by volatilization and adhering to crucible	6.6 " "

The regulus contained 2.66 oz. gold and the residue 0.7 oz. gold per ton.

The residue which contained about 12% antimony was smelted and the metal obtained contained practically all the gold in the residue; this metal was crushed and showered on the top of molten regulus contained in a crucible; the crucible was allowed to remain for a time in the fire to give the metal a chance of settling, and the contents poured. No metal was found at the bottom of the ingot of sulphide, but the regulus had increased in weight by more than the weight of the added metal. It is assumed that the powdered metal oxidized and formed with the sulphide a regulus of oxy-sulphide. This regulus was returned to the crucible and fine iron turnings were added and stirred in; two lots of iron were thus added. Each addition was arranged to reduce 10% of the metal; on pouring, 25% of the metal was found to have been reduced, which on assay proved to contain 84.3% of the gold in the regulus. A number of other experiments were tried on these lines, but nothing practical promised. Another set of experiments was made by fusing the regulus with soda ash and pot-ashes and adding varying quantities of metallic iron to precipitate a part of the metal. It was found that it was necessary to precipitate from 20 to 25% of the metal in order to get over 90% of the total gold concentrated in it. It was evident that it was necessary to precipitate too large an amount of antimony for this process to be of any practical utility.

Leaching the ore with sodium sulphide with a view to removing the antimony, was tried next. For these experiments, the concentrate previously mentioned was used; it was treated with a hot 15% solution of sodium sulphide for six hours, and 82% of the antimony went into solution; but when the residue was assayed, it was found that 17.8% of the gold had gone into solution also. As only 77% of the antimony existed as sulphide, it will be noticed that the sodium sulphide had attacked the native metal; this was expected, and it was for this reason that the sulphide was used in preference to the hydroxide; the sodium sulphide first coats the particles of metallic antimony with sulphide, which is dissolved in excess of the reagent. Of course sodium sulphide was known to be a feeble solvent for gold, but such a marked attack upon that metal was not expected. Solutions of sodium sulphide, both hot and cold, and of varying strengths, were tried, but to get any attack upon the native antimony, invariably meant an attack upon the gold also, and for this reason the use of sodium sulphide had to be abandoned. Wet reactions on the raw concentrate, for the removal of either the gold or the antimony, having proved futile, it was now decided to subject the ore to a preliminary roast. When antimony ore is roasted, two oxides are formed, namely, antimony trioxide, which is volatile and passes out of the furnace, and antimony tetroxide, which is fixed and remains in the furnace with the gangue. The tetroxide is not appreciably attacked by solutions of acids, alkalies, cyanides, chlorine or bromine, so that if no gold were lost in roasting the ore, there appeared to be no reason why the precious metal itself should not be recovered from the residue, by either chloride or cyanide. The proportion of trioxide formed by roasting varies with the temperature at which the operation is carried out; a low temperature appears to favor the formation of tetroxide. Of course the temperature must be kept very low during the early stages of the roast, on account of the low melting point of stibnite.

The concentrate was found to lose from 14 to 30% of its weight by roasting; the variation depending entirely upon the temperature and being due to varying amounts of the trioxide formed. A number of roasts were made and in no case was as much as three per cent of the gold lost during the operation. Chlorination of the roasted ore was attempted first. The chloride of lime used (the best that could be obtained locally) was of poor quality and only yielded 20.5% available chlorine, while material of good quality should yield 35% available chlorine.

A large number of experiments were made, and it was found that 75% of the gold could be extracted from the roasted ore by agitating it for 24 hours with three per cent (of the weight of the ore) chloride of lime and six per cent sulphuric acid. The best results were obtained when all the acid and one per cent of the lime chloride were added at the beginning of the operation, a second portion of the lime chloride after eight hours and a third portion ofter 16 hours' agitation. The large amount of acid was necessary in order to neutralize the lime in the ore itself. An addition of two per cent of salt was made at the termination of one of the roastings with a view to cutting down the acid

necessary and, if possible, of improving the extraction. On assaying the roasted ore, it was found to have lost 49% of the gold, by volatilization. Cyanidation of the roasted ore was less successful than chlorination; the best result obtained was an extraction of 27% of the gold by agitating for 60 hours with 0.2% potassium cyanide and 0.05% cyanogen bromide.

It was now decided to reduce the antimony tetroxide to trioxide, and remove as much of the antimony as possible out of the furnace. The concentrate was mixed with 20% its weight of powdered anthracite and roasted, when most of the sulphur was burnt off. The temperature was raised sufficiently to ignite the anthracite. The quantity of air entering the furnace was now reduced and the charge, which had to be rabbled energetically in the early stages of the roast, was now only turned over every few minutes, when fumes of the trioxide had almost ceased to come away; more anthracite was added and mixed with the charge by energetic rabbling. Anthracite was added from time to time in this way, until its further addition failed to produce fumes of trioxide of antimony; which was the signal that the roast was completed.

In the small-scale experiments made (200 to 500 grams) it was found that this concentrate required about 40% its weight of anthracite in order to remove nearly the whole of the antimony; powdered coke answered equally as well as anthracite. Experiments showed that the residue could be relied upon to contain 97% of the gold, and in several of them it contained over 99%. By carefully regulating the draft, the antimony contents of the residue have been reduced to as low as 0.6%, but it more often ran from 1 to 1.5 per cent.

The theory of the process is, of course, evident. The tetroxide is reduced first to trioxide and then probably to metal, while the incoming air oxidizes the metal first to trioxide and then to tetroxide; in this way, the antimony is oxidized and then reduced, and at each oxidation and reduction it passes through the stage of trioxide when it is volatile and has a chance to escape out of the furnace. The antimony trioxide is collected in condensing chambers and is in a condition well suited for direct reduction to metal by fusion with carbon. The condensing chambers will also contain the arsenic and zinc as oxide and a little of the lead also as oxide, but as the two former exist in such a small proportion in the original concentrate, they will probably not seriously affect the antimony produced. With regard to the residue, it contains from 5 to 6% lead, together with 1 to 1½% antimony and is clearly suitable for smelting, as it contains in itself nearly sufficient base metal in which to concentrate the gold. A sample of the residue was submitted to the American Smelting & Refining Company for a quotation, and they offered to pay for the whole of the gold at $20 per oz., 4.5c per lb. for the lead, less 1.5c importation duty and to charge $6 per ton for treatment.

Here then appears, as far as it is possible to tell by laboratory experiments, a process by which the gold and antimony may be successfully and commercially separated from each other. If the ore were closely concentrated, so that the concentrate contained only from 10 to 15% gangue, the amount of material to be smelted—compared with the original ore—would be quite small. Experiments were tried with both chlorination and cyanide upon the residue, but in neither case was an extraction obtained which would commercially compete with smelting.

Mr. J. S. McArthur—of cyanide fame—has given this ore some attention; unfortunately, his experiments were conducted upon a sample which contained little or no native metal. He has devised an exceedingly pretty process which, however, is not suited to ore containing much native metal. He removes the antimony by leaching it with a two per cent solution of caustic soda; this solution is treated with carbonic acid, which re-precipitates the antimony as sulphide, and the solution—after the removal of the sulphide—is regenerated by the addition of caustic lime. The reaction may be expressed by the following equations:

$$Sb_2S_3 + 6NaOH = Na_3SbS_3 + Na_3SbO_3 + 3H_2O$$

$$Na_3SbO_3 + Na_3SbS_3 + 3CO_2 = Sb_2S_3 + 3Na_2CO_3$$

$$Na_2CO_3 + Ca(OH)_2 = 2NaOH + CaCO_3$$

The residue, after the removal of the antimony, Mr. McArthur first roasts and then cyanides.

In conclusion, it may be of interest to give the method used for determining the antimony. The quantity of material taken for the assay is such that it contains in the neighborhood of 0.2 grams antimony; to this is added 15 c.c. hydrochloric acid and a like amount of water, and it is digested at a temperature of 80° until sulphureted hydrogen ceases to be evolved. Nitric acid is now added, a drop at a time (the beaker containing the assay being replaced for a few minutes on the hot plate after each addition), until the native metal is dissolved. The solution is then filtered from the residue and the latter is washed with a 10% solution of hydrochloric acid. The antimony is precipitated from the filtrate by adding three grams of spongy tin and the solution is kept at about 80° C.; the precipitation of the metal takes from one to one and one-half hours. The antimony is allowed to settle and the liquid decanted through a filter, and the metal washed by decantation, with a 10% solution of hydrochloric acid; the washings, of course, going through the filter.

The metal is washed into a flask, 15 c.c. of strong hydrochloric acid and a few crystals of potassium chlorate are added, and the solution is made up to about 50 c.c. The flask is placed on the hot plate and when the antimony is dissolved, it is boiled briskly until free from chlorine; it is then cooled, three grams potassium iodide added, the solution made up to 200 c.c. with water and the liberated iodine titrated with standard thiosulphate from which the antimony is calculated.

In order to get the antimony in the roasted ore into solution it is first gently fused with potassium cyanide which converts the tetroxide and any insoluble antimonates into the metal. The mass is leached with water and the residue treated as a soluble ore.

Muntz Metal Plates

Written for the MINING AND SCIENTIFIC PRESS by A. R. PARSONS.

The Bamberger-DeLamar Gold Mines Company is grinding ore in a 0.15% cyanide solution, the pulp being allowed to flow direct from the Chilean mills to amalgamating plates. Formerly copper plates 1-8 in. thick with one ounce of silver per square foot were used. These rapidly became rough and pitted, and at the end of two months were found to be ragged at the lower end and practically destroyed unfitting them for amalgamating purposes and necessitating their removal.

As a trial two muntz metal plates 1-8 inch thick, with one ounce of silver per square foot were installed and they proved such a success that the copper plates were replaced by muntz metal throughout. The life of the latter is more than four times that of the former. The muntz metal amalgamates readily, the amalgam being easily detached, facilitating a rapid clean up. The amalgam is not absorbed by muntz metal to such an extent as by copper. This was recently proved on bars formed by melting two old copper and two muntz metal plates, the latter having been in use much longer than the former. New plates from the alloy do not require the careful attention and manipulation that is necessary with new copper plates. The discoloration and appearance of "verdigris" experienced with copper is no longer noticed.

Care must be observed in using mercury for dressing, as the muntz metal will not hold the mercury like copper, and if a slight excess is used it will collect in globules, and for this reason it is advisable to brush the plates more frequently than is customary with copper. We unhesitatingly recommend their use where amalgamation is carried on in a cyanide solution.

On what grade must a flume be built for it to discharge a given quantity of water in a given time? Divide the number of cubic feet of discharge wanted by the area of the section of the flume in square feet. This will give the necessary velocity. Multiply this result by itself and multiply the product by the wet perimeter, in feet, of the flume and multiply the product by 0.0001114. Divide the product by the area of the section of the flume, expressed in square feet. Call this A. Multiply the velocity in feet per second by the wet perimeter, in feet, and multiply the product by 0.00002426. Divide the product by the area of the section of the flume, in square feet. Call this B. Add A and B. The result will be the grade expressed in decimals of a foot

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The extraction of gold from its ore by free milling process consists of two operations: the pulverization of the ore to free the gold from its matrix, and amalgamation of the particles of gold with quicksilver. These two processes, simple in themselves, have many modifications in the practice of various districts, the variations being necessitated by the difference in the character of the ores. Concentration is wholly independent of amalgamation. Some gold ores require no concentration; others can be worked in no other way than smelting.

A New Method of Smelting Butte Ores.

Written for the MINING AND SCIENTIFIC PRESS by WILLIAM A. HEYWOOD.

Since August, 1905, the smelter of the Pittsburgh and Montana Copper Co., situated on the flat about two miles east of Butte, Montana, has been running continuously and producing about 100 tons of copper per month by the Baggaley process. While the entire plant invented by Mr. Ralph Baggaley has not yet been installed, enough has been done, that is different from the usual methods of treatment, to demonstrate the success of his ideas in eliminating water-concentration and roasting, substituting the use of a basic-lined converter producing copper from matte of low copper tenor and employing silicious ore for flux in the converter.

The smelter is situated close to the No. 2 shaft, from which all the copper ore now being mined by the company is raised. The ore has the following average composition:

Copper, 2 to 4 per cent; silica, 52 per cent; iron, 14 per cent; sulphur, 17 per cent; alumina, 7 per cent; magnesia, 1 per cent, and zinc, 2 per cent.

The company also owns the Spring Hill mine near Helena, from which it gets about 50 tons per day of pyrrhotite ore, having the following composition:

	First Class	Second Class
Silica,	9 per cent	30 per cent
Iron,	48 per cent	31 per cent
Sulphur,	32 per cent	13 per cent
Lime,	5 per cent	23 per cent
Copper,	None	None
Gold,	$7 per ton	$2 per ton

Some experiments in smelting this ore pyritically, using Butte ore for flux, have been made, but as the quantity of silicious copper ore is far in excess of the pyrrhotite, a partial pyritic charge has been found more satisfactory. The fuel value of the sulphur in the pyrrhotite is used as well as the iron for flux. The extra base required for flux is added in the form of limestone.

The blast furnace used was designed to experiment with the Garretson process. These experiments proved a failure and the furnace has been used as an ordinary blast furnace. It is built of cast-copper water-jackets, 38 by 158 in. at the tuyeres. It has 14 three-inch tuyeres on each side. The distance from the tuyeres to the charge floor is nine feet.

The materials smelted since September 1, 1905, are as follows:

	In blast	Lime-rock	Butte ores	Pyrrho-tite	Converter and blast furnace Matte	Converter and blast furnace slags	Total	Coke
	Days	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Sept.	22	775	2097	1495	180	170	4717	528
Oct.	31	933	3053	1307	825	624	7078	637
Nov.	25	814	2786	1235	584	302	5723	474
Dec.	31	1143	3551	1631	112	262	6699	606
Jan.	31	1316	3589	1389	200	166	6660	664
Feb.	28	1263	3308	1062	267	225	6125	612

The average of the slag and matte is as follows:

	Cu. in. matte	Cu.	SLAG ANALYSIS SiO_2	FeO	CaO
	Per cent	Per cent	Per cent	Per cent	Per cent
Sept.	8.6	0.11	46.1	21.1	20.4
Nov.	20.6	0.24	42.2	29.7	17.2
Dec.	24.2	0.24	43.6	25.5	18.7
Jan.	28.2	0.21	43.8	21.9	21.4
Feb.	23.8	0.19	44.0	22.0	20.0

These slags also contain 7.5% Al_2O_3; 2.5% MgO; 2.5% ZnO and 0.5% sulphur.

No effort was made to obtain a high rate of concentration in the blast furnace. Employing iron sulphide (pyrrhotite) as a flux, reduced the grade of the resulting matte, but lowered materially the amount of coke necessary to smelt the mixtures and the copper lost in slag. It will be noted that these slags are the cleanest ever produced from Butte ores. As our matte was treated in a basic-lined converter using silicious ore as a flux, this low-grade matte produced in the blast furnace was not a source of expense in converting, as it would be if an ordinary silica-lined converter were used. It might be argued that this occasioned greater loss in converter-slags on account of the greater volume of slag made in the converter from these low-grade mattes. These converter-slags, from November onward, were poured in molten state into the blast furnace, consequently the assay of the blast-furnace slag includes the copper loss of the converters. It will be noted that 624 tons of converter-slag were smelted during October. During this month the slag from the converters was cooled, broken up and added to the blast-furnace charge.

During November, December and January the tonnage of converter-slag is much less, as no account is taken of the molten converter-slag poured through the blast furnace. The slag weighed during those months represents the 'hulls' left in the ladles and the necessary cleaning up about the converters and blast furnace. The amount of slag made per ton of ore smelted varied with the different charges from 1900 to 2300 lb., and the slag-loss is from 5.4 to 6 lb. copper per ton of ore smelted.

Our extraction of copper in the blast furnace has been about 90%. Taking the Butte ore at 4% copper, this would produce 320 lbs. of 25% matte per ton of ore. The iron in this matte when fluxed with Butte ore would form about 300 lb converter slag. As this slag was discharged at 0.24%, the loss of copper in converter-slag equals 0.72 lb. copper per ton of ore smelted in the blast furnace, or a total smelting loss in both blast furnace and converter of less than 7 lb. copper per ton of ore smelted. I have not taken into account flue-dust losses, as with proper chambers and flues the losses in this way are small and are no greater by our method than by the older plan of treatment. At this point it may be interesting to compare our loss of 7 lb. copper per ton of ore smelted with some of the results of other smelters. At Granby, with self-fluxing ore and a charge of nothing but ore and coke in the blast furnace, I am informed that the blast-furnace slag loss is 7 lb copper per ton of ore smelted. At the plant of the Tennessee Copper Company, with a low-grade pyrrhotite copper ore using barren quartz for flux and a double pyritic smelting, the loss of copper is about 9.4 lb. per ton of ore smelted. What the copper loss in the treatment of Butte ores by other companies may be, is difficult to say. Neither the Amalgamated nor the Montana Ore Purchasing Company (United Copper Co.) publish any data regarding their extraction. We do know, however, that a 4% copper ore such as we have been smelting would be consigned to the concentrator and the best saving claimed for water concentration in the Butte district is 80% of the copper. On this basis 16 lb of copper would be thrown away in tailing. In other words, they lose more than twice as much copper before they start smelting as we do during our entire process.

1. We smelt directly our low-grade ores. Others classify their ores and send the high grade to the blast furnace and the low grade to the concentrator. The standard of what constitutes first class ore is gradually being lowered and is now about 5% copper or over. This lowering of the standard indicates the trend of metallurgists to avoid the wasteful practice of water concentration.

2. We employ pyrrhotite or iron sulphide ores for flux. If this has an assay-value it is a much cheaper flux than barren limestone, because it materially reduces the quantity of coke required to smelt the charge.

3. We make a low-grade matte in the blast furnace and thereby make the cleanest slag and the lowest copper loss ever obtained from Butte ores. The employment of a basic-lined converter and the smelting of silicious ore in the converter as flux for the iron in these low-grade mattes enable us profitably to convert low-grade matte where the cost of continually re-lining a silica-lined converter would be prohibitive. Since the other Montana companies started lining their converter shells with ore and adding silicious ore to the converter-charge there has been a gradual reduction in the grade of matte that it is profitable to convert, and there has followed a diminution in their blast-furnace slag-losses.

4. All our converter-slag, except the small proportion that chills in the ladles, is poured molten into the blast furnace. This cleans the slag by allowing the particles of matte to settle; there is a beneficial effect on the blast furnace by scouring it out, and saving the cost of handling and re-smelting.

CONVERTING.—Prior to October 7, the converter plant was not used except in experiments. The old vertical blowing-engine having broken down, a new horizontal cross-compound Reynolds engine was purchased and installed. The blast-furnace matte made up to October 7, was either sold to the Montana Ore Purchasing Company or stored.

The converter employed in the Baggaley process is composed of steel rings 11 in. thick and 18 in. wide. It is lined with one course, 9 in., of magnesite brick. The cap is not lined. The total length of the converter is 13 ft. The length inside the brick lining is 9 ft. 6 in. The outside diameter of the converter is 8 ft; the diameter inside the lining is 4 ft 9 inches.

The method of operating is as follows. About 1000 lb. ore is placed in the converter and a tap of four or five tons of low-grade matte poured in. The charge is then blown with the addition of ore in 1000-lb lots until the matte is 'high', that is, the iron has been eliminated.

The slag is then poured off and a fresh tap of matte added with more ore. When it is desired to finish a charge, the white metal in the converter is blown to copper in the usual manner, without the addition of ore.

The converter works freely and quickly, and its large size permits large quantities of matte to be handled. With matte containing 10% copper I have added 60 tons before finishing it and kept the charge blowing for 48 hours before pouring copper. With matte containing 30% copper we have finished a charge in three hours. The size of the copper charges as poured depends, of course, on the grade of the matte and the number of taps added; we have finished charges of less than a ton of copper and also charges of seven tons of copper. As the lining remains the same size, there is much greater freedom and elasticity in the sizes of charges than with a silica-lined converter.

From October 7, 1905, to January 31, 1906, we have made over 500 tons of copper. The same magnesia lining that was in the converter at the start is still in use. The only repairs have been the renewal of some of the bricks about the tuyeres, on four occasions, when they had become dislodged or broken by the punching of blocked tuyeres. Our blast furnace being small and our ores low grade, we have been unable to keep the converter supplied with matte. If we had all the matte the converter could handle it would turn out over 500 tons of copper per month. As our matte is much lower grade than that which anyone else attempts to convert, to the best of my knowledge, this is better work than was ever done by a silica-lined converter.

With this kind of converter not more than five tons of copper, from low-grade matte, could be made before the converter would require re-lining, that is, the converter would be lined 100 times for our 500 tons of copper. The labor and power used in re-lining is at least $10 per shell, so the saving in labor of re-lining alone is $1000 up to January 31. We have smelted 1118 tons of silicious ore in the converter at practically no cost. The labor required on each shift is one skimmer, one puncher and one helper. The converter has given less trouble than any converter I ever ran, although I had never before attempted this method of converting and the entire force of men were inexperienced in converting in a basic-lined converter.

The following table shows the amount of Butte silicious ore (50% SiO_2; 14% Fe) required to form a converter-slag of 30% SiO_2, 60%FeO with 5 tons of copper mattes of various grades:

Copper in Matte.	Ore Required.
5 per cent.	9350 lb.
10 per cent.	8700 lb.
15 per cent.	8050 lb.
20 per cent.	7450 lb.
25 per cent.	6800 lb.
30 per cent.	6200 lb.

The desirability of using a basic-lined converter and introducing the necessary silica by some other means than the destruction of the lining has been recognized since the introduction of the Bessemer process in treating copper mattes. Until it was successfully accomplished at the Pittsmont smelter, it has never been done.

Mr. Herman Keller, while superintendent of the Parrot smelter, at Butte, about 1890, attempted converting in a shell lined with magnesite. A record of his attempts and failures, written by him, is given on pages 570, 571 and 572 of 'Modern Copper Smelting,' by Peters. The three reasons given by Mr. Keller why the basic-lined converter was a failure and the process abandoned at the Parrot, have never been in evidence at the Pittsmont, in the special converter patented by Mr. Baggaley. Taking the three reasons separately I would reply as follows:

1. The outside of the converter has never been "dangerously hot." Considering the grade of the mattes treated, the converter works much quicker than any silica-lined converter I have ever used.

2. We have never experienced any difficulty in adding silicious ore to the converter in such a manner that it would combine with the ferrous oxide.

3. As the same lining has lasted five months and is still in service, there cannot be any "shelling" of the magnesite brick worth mention. Moreover, if the magnesite lining were now completely destroyed, it has paid for itself in the saving of labor alone required in re-lining a silica-lined converter.

The following are the points of difference between our blast-furnace practice and that of other companies treating Butte ore.

At least 10,000 tons of copper ore are now mined daily in Butte. Probably one-fourth, or 2500 tons, is considered first-class and smelted directly in the blast furnace. The remainder, 7500 tons, is consigned to the mills for water concentration. This ore averages over 30% copper, consequently the loss of 20% in tailing entails a daily loss of over $15,000 before smelting commences. This loss represents at least $2 per ton of second-class ore treated or nearly double the smelting cost at Tennessee or Granby. In order to obtain water, to wash 20% of the values away, most of the ore has to be hauled by railway to Anaconda and Great Falls. The concentrate containing the 80% of the value saved is too fine for pyritic smelting in the blast furnace and contains too much sulphur for reverberatory smelting, consequently it is roasted. This roasting is a waste of the fuel (sulphur) contained in the ore, in addition to the expense of the operation. The roasted concentrate is too fine for the blast furnace, so it is treated in reverberatory furnaces. Reverberatory smelting is not only more costly than blast-furnace smelting, but the losses in slag are much greater.

I am informed that in the blast furnaces of the Washoe smelter at Anaconda, they have tried a mixture of all their Butte ores in the proportion they were received for a year with very satisfactory results. They obtained a 50% matte, lime being used as a flux. If iron sulphides were employed to replace part of the lime, the loss in slag would have been lowered, as the blast-furnace matte would have been of lower grade, and the coke consumption materially lessened.

In the Mineral Industry for 1901, page 698, Dr. Franklin Carpenter states: "I have smelted many thousand tons of Butte copper ores at the Deadwood plant and have no hesitancy in stating that the whole of the concentrating and roasting machinery employed around the Montana smelting works is unnecessary, provided the process of pyritic smelting is employed that was first developed at Deadwood, S. D." Considering the strides in pyritic smelting since 1901 and in view of our experiments, how much more wasteful and unnecessary does the present method of water concentration and roasting appear!

To treat the Butte output pyritically a large amount of iron sulphide ore would necessarily be employed. When the large amount of first-class ore is considered, much less iron and lime would be needed than we have employed in treating only the lowest grade and most silicious of Butte ores. Whether it would be more profitable to bring iron ores to the copper ore or haul the copper ore over the mountains to obtain water to wash away 20% of their value, can easily be demonstrated. Without a large quantity of iron sulphide ores and using only limestone for flux, with what iron ores of any kind that can be obtained, the treatment of Butte ores in blast furnaces and converters has been demonstrated to be more economical than the methods now employed by all companies in Montana except the Pittsburgh & Montana Copper Company.

Adjustable yokes for the support of steam, air and other pipes in mine-shafts may be made by bolting together two pieces of 4 by 4-in. timber, if necessary, larger dimensions, and boring or cutting out on the center line a hole having a somewhat smaller diameter than that of the pipe. The bolts may be unscrewed, one side taken off and the yoke placed in position in the shaft, the ends resting on the timbers. The bolts should have square heads and each end should be provided with a washer of sufficient size to prevent the bolt-head or nut from sinking into the wood when tightened. A yoke of this kind may be changed from one set to another, if occasion requires. Pipe should be connected with flanges, at least every 40 to 60 ft. of its length. Ordinary sleeves may be utilized at the intermediate joints.

Every group of mine and mill buildings should be protected from danger of fire by hydrants situated at points commanding the various buildings. At some California mines giants such as are in use in hydraulic mines are placed at some central point where any of the buildings or timber piles in the yard may be reached with a large stream of water under high head in case of fire.

In the early stage of development of a quartz mine it is often impossible to tell whether or not the ground is more valuable for mineral or agricultural purposes. A vein small and low-grade upon the surface may develop into a very valuable mine in depth. Several such instances are of record in California.

Special Correspondence.

LONDON, April 11.

From an intermediate report issued by Stratton's Independence Ltd. it appears that the development work during the first half of the current financial year to December 31, 1905, amounted to 2035½ ft., comprising 928½ ft. in drifts, 527 ft. in raises, 13 ft. in winzes and 567 ft. of crosscuts. It is noteworthy that of the 48 points of development 44 show substantial average assay-values, these running from $12 to $36 per ton. The stoping amounted to a total of 31,026 tons of crude ore, which averaged $22.7 for an average width of 4.23 ft. It is stated that in the granite area, ore continues at and below the 200 ft. level. During the six months under review, July to December, 1905, inclusive, 16,027½ tons of shipping ore were produced from the mine and sold, of a gross value of £128,033. From the dump, 2,192 tons of shipping ore were concentrated and sold, of a gross value of £3,728. Total gross value of sales £131,761. Average value of the shipping ore, 1 oz. 17 2-5 dwt. gold per ton.

According to the report, the royalties and share of profits received from the lessees during this period amounted to £37,613. After adding sundry receipts and deducting the Company's establishment and other expenses, there was a net profit at the mine of £31,926. The net profit at the mine for January last from 2,930 tons of shipping ore was £6,093, and for February from 2,112 tons of shipping ore £4,065. Total for the eight months £42,084. It is thought that under the new and augmented number of leases which run to August next, an increase in the production of ore may be looked for during the four months—March to June inclusive—to complete the financial year. The Profit and Loss Account, inclusive of profits to February 23, 1906, is shown to be approximately as follows:

Balance brought forward from June 30, 1905		£63,409.7.9
Add: Profit at mine, eight months as above	42,084.0.0	
Less: London expenses for the period, say	1,800.0.0	
		40,284.0.0
		103,693.7.9
Deduct three dividends of 6d. per Share, paid August 22, 1905, November 22, 1905, and April 10, 1906, respectively		75,000.7.6
Approximate credit balance, subject to audit		£28,693.0.3

The dividends paid by the Company now reach a total of £979,173.10.5. Reference is made to the Cassel process and it appears that further expert examination of the Cassel filter having amply confirmed the favorable opinion previously held of its merits, the Metals Extraction Syndicate, Limited, (in which Stratton's Independence Company holds a 1-5th interest) have exercised their option, and a parent company is now being formed to take over the filter and process patents for the whole world, with the exception of the Cripple Creek district. The company in question is to be registered with a nominal capital of £200,000, of which £25,000 has been guaranteed for working capital. The report concludes by stating that the proposed company (for which the rights have been reserved as above mentioned) to work the filter and process in the Cripple Creek district, has not yet been formed. Before this is done, prolonged and very careful investigation must be made into the values and quantities of ore available, before the erection of a mill, which will take a large amount of capital, can be definitely decided on. The dump is being very thoroughly sampled, and the consulting engineer, Mr. Geo. A. Schroter, is making a careful examination of the low-grade ore resources of the mine.

From the same "shop"—3 Princes Street, E. C.—another intermediate report has just made its appearance. It deals, in the first place, with the gross returns and other results of six dredges of Oroville Dredging Limited for the three months November 1905 to January 1906. During this period 794,669 yards were washed for a total return of $135,251 or an average yield of 17 cents per cubic yard. The operating costs amounted to 4.05 cents and the renewal costs 3.37 cents per cubic yard. The report states that the slight increase in the operating costs is due partly to the fact that a great deal of running time was lost during November and December, on account of poor power service occasioned by the long droughts incidental to the early winter season. It is pointed out that during the temporary shut-down, advantage was taken for general overhauling, which also increased the cost per yard at the mine, but the following months will derive the benefit of the repairs thus executed. The net profit, three months from the six dredges, operating on two properties only, viz., Boston and Oroville and Boston and California, is shown as $70,249.68. The returns from the Exploration Company's property began to come into the account as from 1st January last, and for that month yielded a net profit of $5,426.28. For the month of February the net profit from the three properties with the two additional Exploration dredges amounted to $45,000, a large increase on the previous monthly average from the two properties. After adding the profit from the machine shop and sundry receipts, and deducting the Boston office expenses, a net profit is shown for the four months of $121,375.96.

Referring to the Boston and Oroville property, the general manager, Mr. W. P. Hammon, reports: "Reviewing the operations of this company's dredges for the past six months, none of them seem to have been in average ground much of the time, and from the present positions of the machines, I would expect a marked improvement very soon. No. 1 has a long stretch of good ground before it; Continental, no doubt, will improve, and with the completion of No. 4, we will add materially to the output of this Company very soon." And on the subject of the Exploration Company's property, he remarks that the two dredges now added are doing well.

In their report the London committee state that with regard to the four new modern dredges, "Boston and Oroville No. 4," is expected to be completed by the end of April, while "Exploration No. 3" should be ready by the end of July. The third new dredge should also be available about that time, and the fourth will be put on order as soon as the first is running successfully. On the financial position they remark that with the issue of the 130,000 shares for the Exploration property recently made, the entire capital of 700,000 shares of $5 each now carries dividend, which, at the rate of 10 per cent per annum, requires monthly profits of a little over $29,000. Although the last quarterly dividend—paid on the 29th ult.—was from accrued funds to end February, which included only two months' profits on the working of the Exploration property, a surplus of profit is reported of $44,501.74, after payment of two quarterly dividends at the rate of 10 per cent. per annum. The London committee also draw the shareholders' attention to the fact that the two quarterly dividends at the rate of 10 per cent. per annum have been earned practically from the working of six dredges. With the addition of the two dredges now at work on the Exploration Company's property, and the four new dredges of the most modern type, all of which should be in operation before the end of the current year, the yardage capacity will be more than doubled, with less average operating cost. From these facts the committee conclude that no difficulty will be experienced in bringing up the net earnings to the rate originally contemplated, of upwards of 20 per cent. per annum.

At the seventh ordinary general meeting of Mount Boppy Gold Mining Co. Ltd., held last week, the chairman, Mr. A. Hoffnung, gave the shareholders a somewhat glowing account of his visit to the mine. He described how, accompanied by the superintendent, Mr. Thomas Pascoe, and the underground manager, Mr. Richards, he spent some considerable time exploring the various levels from the surface down to 400 ft., which was the lowest depth the mine had attained. He said he seemed to be traversing interminable distances beside gigantic walls of gold-bearing rock, the lode varying in width in places up to 60 ft. or more, and the value from a few pennyweights up to ounces of gold per ton, and considering the moderate depth yet reached he was struck with the possibilities before them both laterally and on deeper sinking. His inspection of the surface and efficient mill and appropriate machinery, an extensive cyanide, slimes and filter pressing plant. The chairman said he must not omit to mention the reservoir, which presents all the appearance of a capacious lake. They were rather concerned of late owing to the long absence of rain, and the diminution of their water reserve in consequence of the great evaporation, which is at its highest during the intense heat of summer, but the superintendent had cabled the news of welcome rain which as given a full 12 months' supply in the reservoir. Referring to the Cobar division of New South Wales, in which the mine is situated, the chairman spoke of it as one of the most prolific in valuable minerals in the State—gold, silver and copper are abundantly and prominently in evidence. The Great Cobar mine is one of the famous copper mines of the world. The official report of the Warden of the district, which he had before him, specifies the values of the output during the past four years as follows: Gold, £844,195; copper, £1,037,412, and silver, £23,176, aggregating two millions sterling, the product of the last year (1905) being considerably in excess of any of its predecessors. The number of men engaged in the various mines is 2,009, and the value of the machinery employed is £282,794. The district affords so much encouragement that the Warden refers to the presence of 400 prospectors on various parts of the Cobar field, where a discovery was recently made of an important outcrop, which gave such encouraging evidence of the probable existence of extensive deposits of gold, silver and lead, that the shares of the syndicate which was formed to explore it advanced to a phenomenal figure.

Dealing with the results in 1905, the year under review, the chairman said the mine had given gold to the value of £116,433.19.11, which affording a dividend of 47½ per cent. Thus the production of gold during the 48 months that the mill had been at work had each year steadily increased, and totalled the respectable sum of £330,610.2.9, or about three times the amount of their original capital, whilst the dividends had amounted to 133¾ per cent., aggregating £150,357. He reminded the shareholders that out of an area of 293 acres they had up to now actively carried on stoping operations within a space of only about 13 acres to a depth of but 400 ft., from which they had not only obtained the above-named results, but had disclosed the very ample reserves estimated at 182,000 tons, which should be worth more than £400,000, and on the same basis of calculation, that is, taking the net results of the past year, should contain a profit of about £230,000, or nearly double the amount of their capital.

The following cablegram just received refers to the report of the Geduld (Transvaal) commission of inquiry (consisting of Messrs. Weber, Wentzel, Leonard, and Sidney Jennings) appointed by the board to investigate the discrepancies discovered in connection with the assays taken from the No. 2 shaft: "Report of commission received. States commissioners have obtained evidence from all persons connected with taking and handling samples, as well as from assayers; also had tests made by metallurgical expert. Commissioners state delay caused through necessity taking evidence Europe of engineer, who meanwhile left Rand. Commissioners state in their opinion all reasonable precautions taken with regard to taking samples on mine, and difficult conceive any tampering or irregularity occurred there. Commissioners' finding is five samples, three from footwall leader and two from cross sections, represent either rock from some other locality than Shaft No. 2 or that free milling ore has been added to original samples. Commissioners have beeen unable to ascertain in what manner or by whom tampering samples effected. Investigations failed elicit any information justifying cast suspicion on any particular individual. Commissioners express appreciation of assistance rendered by board in acquiring evidence."

For the month of March a record gold output from the Rand is announced of 443,723 oz., exceeding the previous highest figure by 12,129 oz. A slight contraction in the industry is, however, noticeable; as compared with February there is a decrease in the average daily output of 246 oz. owing, it is said, to the diminished supply of unskilled labor.

Proof of the reviving interest in Cornish mining, consequent on the continued high price of the white metal, is to be found in the prospectus published "by way of information only" of The Cornish Consolidated Tin Mines Ltd. The capital is £100,000 in 99,000 ordinary and 1,000 deferred shares of £1 each. A good start has been given by the subscription of the seven signatories to the Articles of Association for 45,000 ordinary shares. The entire capital of the Company will be available as no brokerage commission or promotion money has been paid. The three directors are well known in mining and Stock Exchange circles. The purposes of the Company include the financing of mines already working and the supplying of information regarding Cornish mines. Some good points are made in this prospectus. It shows that during the past half century there has been no period when Cornish mining, given scientific methods and ample working capital, was not a paying proposition, and that with these aids it is highly payable at anything like the present price of tin. Taking the entire county, lode-values for tin may be assumed to average 2 per cent. of black tin or over £2 per ton, equal to 10 dwt. of gold, whilst working

costs should not reach one-half that amount. It is pointed out that, in addition to tin and copper,the county produces galena, zinc-blende, wolfram, iron and arsenical pyrites and a variety of rare minerals, which owing to their occurrence in complex form have hitherto proved rather a detriment than otherwise, but the marked success of Clitters United Mines Ltd. in dealing with such ores has practically opened up a new industry.

NOME, February 22.

Ten years ago the principal gold producing sections of the United States were California, Colorado, Arizona and Idaho; Alaska was then considered to be too cold, bleak and barren to become a mining country. And yet within the last ten years Alaska has produced over $40,000,000 in gold alone and by the arrival of the first boats in the spring there will be in the neighborhood of $5,000,000 more accumulated in the banks, awaiting shipment to the mints as the result of the winter's work since the close of navigation last October. Still the mining industry is only in its infancy, not half of the country now known is prospected and the greater part is still unexplored.

This is not a poor man's country. It is a country for capital, and nowhere is there better opportunity for the wise investment of it with a better chance of large returns than in Alaska today. There have been a few poor man's propositions where all the capital required were the tools and primitive equipment, with a month's provisions, to develop the claims to the point of paying a profit. Many more of these may yet be discovered, but they are so few when compared with the number that require capital to develop them, that a poor prospector's chance is slim. Alaska is not an easy country to explore by any means, for the prospector meets with many difficulties, which are at times discouraging. The successful Alaska prospector must be a man with determination and sufficient funds, say $1,000 or $1,500, to carry him through a couple of seasons. The novice without capital, trade or profession has no place here. For example, we will take the first discoveries on the now famous Little Creek, that has, up to the present writing, yielded over $2,000,000. About the middle of September, 1904, J. C. Brown offered his claim for sale at $6,000. It went begging, and had he found a purchaser at that price, it is not likely that the $6,000 would have paid him for what he had already spent. Determined to win, he kept on; a short time afterward he was rewarded by finding the rich streak from which he has been extracting pay-dirt ever since. Then followed the discovery on the Portland bench. The three tenderfeet who made the discovery sunk and drifted in every direction, and finally got discouraged, and were about to quit when they decided to put in one more thaw. This thaw revealed a 40-cent pan and kept increasing until it ran into hundreds of dollars to the pan; the claim yielded nearly half a million dollars in gold in the next six weeks.

The climate is the worst drawback to Alaska. At the most, the open season does not last over four months and during the remaining eight of the year the land is ice-locked so that transportation and communication by water are at a standstill; also all open surface mining; which practically makes one year's surface or placer mining in California equal to three years in Alaska. The drift mining carried on during the winter has become a permanent branch of the industry. The average depth of the ground in the Nome region where winter drifting is carried on successfully, is from 80 to 100 feet.

Notable among the rich strikes made this winter is that made on the Cyrus Noble claim, situated above the head of Bourbon creek, in the foothills about five miles north of Nome. The pay on this claim is found in an old beach deposit, which runs along the foot of the present hills; pans running as high as $500 have been taken from this claim. So far as the claim is exploited at the present time, it shows a paystreak about 40 ft. wide. This claim is destined to become one of the great producers of this section in the near future. Another rich and important strike has been made only a few days ago on No. 8 Cooper gulch. This claim is situated on the tundra just below the foothills where Cooper gulch empties into the tundra. It is apparently on the same old beach deposit as the Portland bench and Cyrus Noble. It is now predicted that it will prove the richest discovery ever made on the tundra. The future of the Seward peninsula as a quartz mining country of importance is encouraging. More promising quartz discoveries have been made in the past season than at any time in the history of the peninsula. Aside from the tin mines and free-milling gold ore, important discoveries have been made of lead (galena carrying silver) ores, telluride, cinnabar, platinum, manganese, talc and native metallic bismuth. The discovery of bismuth was made last summer by Louis Dahl, in the Sawtooth range, which heads the rivers flowing into Bering Sea on either side of Nome for a distance of 40 or 50 miles. The bismuth, which has rarely been found in this condition in nature, is in a metallic form, of a silvery gray color and lies in a matrix of bluish quartz, somewhat similar in form to cubic crystals of iron pyrite, such as are commonly found throughout Calaveras and Butte counties, California. Judging from the samples of the ore I have examined, it will go 25 to 30% bismuth. There has not been development work enough done yet on the ledge to prove how extensive the orebody is. The development work on other quartz lodes, however, has progressed far enough to show that at no distant date the familiar sound of the stamp-mill will be heard in many places within a day's journey of Nome.

DENVER, April 14.

The enterprise of the Yak Mining, Milling & Tunnel Company, is of great importance, not only to the Leadville district, but to the entire State; on account of the magnitude of the operations, the successful utilization of electric power and its close connection with the American Zinc Extraction Company. The Yak company is developing ground and opening up bodies of ore, from the portal of the tunnel throughout its territory, to the Ibex property, an extent of two miles, and laterally one-half mile on each side of the tunnel. The company generates electric power for its own use; its power-house is equipped with modern appliances affording the utmost elasticity, convenience and economy of operation. The electro-mining machinery consists of impact drills, diamond-core drills, pumps, mine-hoists, etc. The many applications of electric power, though more varied than those of other mines of the State, have not superseded the use of compressed air for particular operations. A prominent official of the company states that the electric-driven drills are not found to be as satisfactory as the air-actuated machines.

Though also treating other ores, the American Zinc Extraction Company's mill, with a daily capacity of 200 to 300 tons, is operated in close connection with the Yak property. In the mill there is conducted a special zinc-separation process, in which the International separator plays an important part. The whole problem of the Yak company is to mine cheaply and prepare for market large bodies of low grade ore. As a result of its operations to date, it is paying small dividends on its stock, with reasonable expectations of increasing them.

The Argo Mining Development, Transportation and Tunnel Company, owning the Newhouse Tunnel, in Clear Creek and Gilpin counties, has let an extension contract of 1000 ft. to Silas A. Knowles, formerly superintendent for the company. The bore is completed for a length of about three miles and the company is now considering extending it one and one-half miles further. J. J. May, recently superintendent of the tunnel, vacated that position to conduct operations on his own property in Mexico.

Louis Kannta, president of the Black Bear Mining Company of Telluride has contracted for a 10-stamp mill, which will be erected close to the Black Bear mine in Ingram Basin. The Wagner Bros. operating the Bradley mine near Telluride, have installed ten new stamps in the old Cimmaron mill, across the gulch from the Bradley, and expect to add 30 more stamps this season. In 1896 the operators of the Bradley-Pioneer Gold Mining Company stripped the ore in an adit drift for a distance of several hundred feet. Considerable money was raised in London for the operation and purchase of the Bradley and Pioneer properties, part of which was legitimately applied to the purpose intended and a larger part diverted, misapplied and squandered. A member of the directory not a party to the shady transactions, transmitted a detailed statement of the disposition made of the money sent from London to the agent at 10 Throgmorton Ave., London; naturally the remittances ceased, the options ran out and the property passed into other hands. The mine was thereafter worked at intervals without discovering ore, until last year, when the Wagners broke down the stripped ore, disclosing a continuous pay-streak two to four feet wide of an excellent milling grade. It is said the drift was run 400 to 500 ft. alongside the pay. The Bradley promises to become a heavy producer of lead, silver and gold ore. It is unfortunate that the Englishmen did not take legal measures against their representatives on this side and hold the property.

The Smuggler-Union mill at Pandora is dropping 120 stamps on ore produced by lessees.

Newspaper reports to the effect that the Camp Bird would rebuild its stamp mill in, and remove its plant to the town of Ouray, are denied by the management. The cyanide plant and other buildings, representing a large investment, are too valuable to abandon. The stamp-mill will be rebuilt on practically the same ground it formerly occupied and protective measures will be taken to prevent a repetition of the recent disaster.

Several successful runs have ben made at the Ross smelter, formerly the Kendrick smelter, at Silverton, by Mr. Hoyt, productive of a 55% copper matte. The smelter has been closed on account of the snow blockade making it impossible to get ore to it, but it will be started again as soon as ore can be delivered.

In a lawsuit brought by the Mine and Smelter Supply Company against John S. Carey for stock of the Wilfley Ore Concentrator Company of London, Judge Booth M. Malone on the 13th inst. rendered a decision in favor of Carey. Plaintiff's attorney stated to the Court that his client might move for an appeal, and the case was not dismissed.

Mr. Forrest D. Goody, who made a successful run of 2100 tons by cyanidation of the Golden Fleece (Hinsdale county) mill-tailing last season, will commence similar work again about June 1st.

Denver and Rio Grande Railway trains reached Silverton on the 14th inst. after a snow blockade lasting since March 18.

WASHINGTON, D. C., April 21.

During the coming summer the Government will extend its hydrographic investigations to Alaska, in order that data in regard to water supply, which is the important factor in the mining operations of this territory, may be available.

The United States Geological Survey since 1898 has devoted much time and energy to the study of the conditions which pertain to the production of gold in Alaska. These studies have included geological investigations, methods of mining, and topographic surveys; and the results, which have been published in the various reports of the Geological Survey, have been of great assistance, not only to those who are now working in Alaska, but to all interested in its development. The topographic surveys have yielded excellent reconnaissance maps of many of the developed portions of Alaska, and some detailed maps of the more important mining districts. The geological investigations have furnished many facts bearing on the distribution of gold in the various districts. The methods used in mining have been carefully studied and compared. Information in regard to general conditions, such as climate, transportation facilities, etc., has also been collected and published.

In 1905 four-fifths of the total gold output (about $15,000,000) of Alaska, was taken from placer deposits, for the development of which an ample supply of water is essential. This water supply is obtained from surface streams, and but little information is now available in regard to the flow of these streams or its distribution throughout the season. Such lack of information often causes financial failure in mining as well as other hydraulic works. The importance of such an investigation to a placer field is well illustrated by the conditions in the Klondike where, the richest placers having been exhausted, the gold remaining in the gravel can only be reclaimed by the installation of expensive hydraulic plants. This installation will, however, have to be delayed because there is little accurate data available regarding the run-off of the streams, and hence the advancement of the mining industry of the district will be retarded until the hydrographic surveys are completed.

For a number of years the Geological Survey has carried on systematic study of the water supply in the United States as one of the great resources of the country, in order that data might be available for engineers and others who contemplate making hydraulic developments. These data are now available for all the more important streams in the United States, and are extensively used in problems of power development, city water supply, irrigation and manufacturing.

The hydrographic work in Alaska during this season will be confined to the Nome region in the southern part of the Seward Peninsula, where a party in charge of Mr. John C. Hoyt will spend the entire season collecting information in regard to the more important streams which are now being utilized in mining operations. Later the work will be extended

streams in other portions of Alaska. It is expected, however, that the data collected during the coming season will be of such general nature that estimates can be made by comparison of the water supply in other sections than that in which the operations are carried on.

DENVER, April 23.

Colorado has often been blessed by the fact that her mines are difficult to exhaust. This is not due entirely to the persistentence of the orebodies. It is due almost as much to the fact that while persistent, they are often not continuous, but inclined to be erratic. If the ore-shoots were continuous like coal seams for instance, Colorado would probably have been worked out long ago, for it is not part of the American disposition to tarry long over converting developed ore into bank account. At the present time Leadville and Cripple Creek are demonstrating the seeming inexhaustibility of Colorado's resources. Leadville was not only given up for dead by the doctors, but was spoken of by her friends as one of the noble departed ones. Her funeral sermon had been delivered and her epitaph written, "Here lieth Colorado's greatest mining camp." Now Leadville arises from her casket, striding forth a juvenated giant. The recent discoveries in the Mammoth, the Yak tunnel, and the Bessie Wilgus have proved that there is a mineralized area surrounding Leadville that was little dreamed of, even in its palmiest days. There is one orebody exposed in the Yax tunnel which is 50 ft. thick, 125 ft. wide and 275 ft. long and of better than average grade. These figures do not define the limits, but represent development—up to those limits. The discovery in the Mammoth is stupendous, but development has not progressed sufficiently to demonstrate the extent of the orebody. This discovery proves, however, that the typical Leadville orebodies underlie Big Evans Flats, and this district alone is larger than the famous old down-town section.

The discovery in the Bessie Wilgus is of the high-grade, silver-chloride character of stuff. The orebody is large as well as rich. These three new districts indicate that the mineralized area of Leadville is shaped like a frying-pan, in which old Leadville was confined to the handle. The Little Johnny seems to feel the general re-awakening and is threatening to beat all past records in the way of tonnage.

The new discoveries, strange to say, all lie between the old camp and the Mosquito range. Down in the other direction they are going after the deep leads that are believed to lie there. The mining world has been prepared to hear of rich strikes in that locality for some time, but was surprised to hear such good reports from the other side of the camp.

Cripple Creek is likewise disproving the theory that her ore-shoots did not go down. Cripple Creek's ore-shoots are lenticular in form, and there are about as many of them at one level as on another.

D. W. Brunton's report advocating the driving of the deep drainage tunnel assures us that, as far as engineering skill can determine, the Cripple Creek orebodies are still abundant and valuable in depth.

With both Leadville and Cripple Creek getting their second wind Colorado can afford to take an optimistic view of things in general and of her mining possibilities in particular.

The snowslides in the San Juan are already things of the past and now is the time to expect new discoveries in that quarter. It may not be generally known that many of the good mines of the San Juan were laid bare by snowslides. Every spring the prospectors eagerly watch the retreating snows wherever a snowslide has scught a new path, to see what may have been uncovered by the slide. This year hundreds of hillsides have been scraped bare of everything but solid rock that were never exposed before, and the prospectors are apt to reap a rich reward.

DENVER, April 24.

The death of Edward G. Stoiber has cast a gloom over mining circles in Denver. He died, after a short attack of typhoid fever, on Saturday, April 21, 1906, at Paris, France. About two months ago Mr. Stoiber was around Colorado renewing acquaintance with his old friends, of which he had a large number. Mr. Stoiber was modest, retiring and scientific. He seemed almost out of place in the rough and tumble struggle of a mining camp. Yet he succeeded where others had failed. He built up a splendid enterprise based on the Silver Lake mines near Silverton, Colorado. Although not at all gregarious, he endeared himself firmly to a large circle of friends, all of whom feel that one of the oases on this world's desert has gone dry with his death. He is survived by his wife, his household not being blessed with children. Mrs. Stoiber was half partner with her husband in his mining enterprises and is one of the notable women of Colorado. She is renowned for her indomitable spirit and her generous hospitality.

The contract was let for a 50-ton concentrating mill at Silver Plume on April 17. This event is of special interest because it is the fourth mill to be erected in Silver Plume within the last year. It is truly wonderful the way these old camps revive as metallurgical processes improve and mining costs become lessened. Three years ago I rode through Silver Plume and a deader looking place I have seldom seen. Now all is bustle and energy. The stores are being re-painted and the sidewalks renewed. Prosperity has come again, not so much through the work done underground at Silver Plume, as through the patient toil of the inventors and metallurgists in Denver where improved processes for treating complex ores have been worked out and better mining machinery designed and made. Along the same general line of activity may be mentioned the recently ordered mill for the Black Bear Mining Company of Telluride. The Black Bear is no new discovery. It has been known and worked more or less for a long time, but the recent improvements in mining machinery make the prospective profits much greater than they would have been a few years ago.

The rise in the price of silver, lead and zinc also has its beneficial effect on the mining industry of the State, and as the winter snows go off, it is evident that an unusually large number of "outfits" are starting forth to prospect and do development work.

SALT LAKE CITY, April 23.

The annual meeting of shareholders of the Star Consolidated Mining Co., operating in the Tintic district, resulted in the election of H. G. McMillan, C. M. Freed, J. P. Turner, F. D. Kimball as directors. About 3,000 ft. of development was performed during the year and Superintendent Turner, in his report, gave assurance that conditions were more favorable than a year ago; that there are from 20,000 to 30,000 tons of mill ore available which will net anywhere from $5 to $7, while there is a large tonnage of silicious ore which the smelters will need later. The receipts of the year amounted to $28,984.72, which includes $23,602.12 received from two assessments. The disbursements exceeded receipts by $174.70. The present indebtedness is $26,740.61.

The ore-shoot opened on the 1500 level of the Daly-Judge mine at Park City, is entirely in virgin ground, there being no levels above or below it, and it has been found to be 270 ft. long. The shoot is believed to be as large as any ever found in the Daly-West, adjoining, and carries principally lead and silver. The company began the year with a bonded indebtedness of $209,000, and other obligations to the amount of $30,000. After a vigorous development campaign of 18 months, production was resumed Jan. 1, last. Since then, $97,000 worth of bonds have been paid, also the $30,000 item, leaving $112,000 of the bonded debt to be met. But the company has been clearing about $50,000 monthly, and has not crowded extraction. Stoping will begin on the 1,500 at once, which means an increase in output as well as in earnings. An official says the company will be entirely out of debt in June and have a surplus.

The Bingham Central Mining Co., at Bingham, has had placed to its credit the proceeds from the sale of the $200,000 worth of bonds recently placed, on which it will draw for the further development and equipment of its mines. The property is situated in the upper part of the camp, near the Boston Consolidated, and Utah Consolidated mines.

The management of the West Quincy mine at Park City will shortly undertake the further development of its ground by the use of core drills, to be operated from the 440 level. The lower workings of the mine are filled with water. G. B. Turner, manager, says the water level is considerably lower than a few months ago, and he believes development in adjoining mines has afforded an outlet, which means that in a little time the ground will probably be entirely drained.

Tony Jacobson of Salt Lake City, president of the recently organized Columbus Extension Co. at Alta, has placed an order for power equipment, and as soon as it is installed will begin driving a tunnel to tap the ore bodies. The proposed adit will be nearly a mile in length when finished.

The tunnel being driven on the Indian Queen mine in Beaver county is in 500 feet, and the new shaft at the Tetro mine in the Tintic district is nearing 400 ft. depth.

The initial shipment from the Little Bell mine, at Park City, amounting to 205,450 lbs., was sold on controls showing 69 oz. silver, 22% lead and 2.3% copper.

At the Waterbury leaching plant, built at Newhouse to leach the carbonate copper ore of the Cactus mine, the tests are now in progress.

The Utah Copper Co. has begun the excavations for the second section of the large concentrator, now in course of construction at Garfield. The foundations for this unit are to be completed by August 1.

R. H. Channing, Jr., manager of the Utah Consolidated Mining Co., has gone to the executive offices of the company in New York, and there is a well-founded belief that while there plans for future smelter enlargements will be discussed and which are fully warranted by present mine conditions. This statement is borne out by Channing's recent report to shareholders in which he stated that during 1905, 12,444 ft. development work was performed and that 4,586 of this was in ore, the result of which was to put in sight nearly 300,000 tons of ore, all from orebodies, the existence of which was not previously known, and that in at least two of these the limits have not been determined. He aims to keep two years ahead and deems that is all that is necessary.

Latest Market Reports.

Anglo-American Shares.
By Wire from London, April 26.

	April 19. £ s d	April 26. £ s d
Camp Bird	1 4 6	1 4 3
El Oro	1 7 3	1 5 0
Esperanza (ex-dividend)	3 19 4½	3 18 9
Dolores	1 17 6	1 17 6
Oroville	0 18 6	0 17 4½
Stratton's Independence	0 7 9	0 7 0
Tomboy	1 8 0	1 7 6

(By courtesy of W. P. Bonbright & Co., New York.)

METALS. By wire from New York.
Average price for weeks ending:

	April 19.	April 26.
Lake Copper	$18.62 @$18.75	$18.62 @$18.75
Electrolytic	$18.25 @$18.50	$18.25 @$18.50
Casting	$18.00 @$18.25	$18.00 @$18.25
Lead	$ 5.35	$ 5.47½
Spelter	$ 6.06	$ 6.05 @$ 6.10
Silver	$ 0.64⅞	$ 0.65⅝

Trade Treatises.

The Taylor Engineering Co. of 114 Liberty St., New York, has issued Bulletin 50, descriptive of their furnaces and smelting accessories. It contains a brief chapter on smelting and smelters and illustrates with excellent half-tones their several types of furnaces; forehearths, both movable and stationary; converters; hot-blast stoves and blowing engines.

Commercial Paragraphs.

The following orders are reported by the Lima Locomotive & Machine Company during the past week: New Orleans, 20-ton; San Francisco, Cal., 55-ton; Mobile, Ala., 65-ton; Shabuta, Miss., 28-ton; Shivers, Miss., 20-ton; Blind River, Ont., 28-ton.

The Pelton Water Wheel Co., San Francisco, state they are filling orders as usual from their eastern works and are in a position to furnish estimates on water wheels, sheet-steel riveted and lap-welded pipe, and complete hydraulic plants. Their new factory at 19th and Harrison St., San Francisco, was not injured by the recent fire and will be rushed to completion. As soon as this plant is finished the company will make shipments direct from the new plant.

Herman Unzicker, formerly with the old firm of Fraser & Chalmers and later with the Allis-Chalmers Co. is now associated with Chalmers & Williams, Railway Exchange, Chicago. Mr. Unzicker will be in the sales department and cover the territory west of Chicago.

The National Carbon Company, Cleveland, Ohio, are installing in their works at Clarksburg, W. Va., a 600 brake H. P. Koerting gas engine. supplied by the De La Vergne Machine Company of New York.

G. Frank Schwep has been at the head of the purchasing department of the Ingersoll-Sergeant Drill Company for the past thirteen years and was located at the shops at Easton, Pa., and Phillipsburg, R. I.

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EDITORIAL.

THE RECENT OCCURRENCE shook a lot of the smallness out of humanity and made it big in generosity and in courage. It is curious how the old spirit of the pioneer days has descended on men who never expected to face the simple realities of life, as their fathers knew them in 1849. The spirit of the Argonauts has been transmitted and the people of San Francisco—nay, the people of California—are as full of life and hope in the rebuilding of their great City as were those who reclaimed the sand dunes, filled the marshes and leveled the hillslopes on which San Francisco was erected forty years ago. We used to date the beginning of the State from the rush of 1849, henceforth we shall speak of the new awakening that followed the event of 1906.

IT RECALLED old times in Colorado to see a train of supplies from that State arriving at Berkeley, in aid of those who suffered by the San Francisco conflagration. But when we saw two cars labeled from Denver and another from Breckenridge, it seemed like a message from personal friends. Good little Breckenridge, famous the world over for the wonderful specimens of native gold, has proved the possession of a warm heart and a helping hand—something that gold does not buy and more exquisite than the most gorgeous of the crystalline aggregates that come from the mines of Farncomb hill. Indeed, one of the great compensations of a disaster that appeals to the imagination and sensibilities of mankind, is the stimulation of sympathy and the emphasis placed upon the essential kinship of the race. We do not doubt as to who is the most enriched, the sufferer who receives aid in time of trouble or the man whose whole nature is uplifted by a noble impulse.

THE CONFLAGRATION was so complete that many former buildings are indicated by a mere remnant of rubble. Whole blocks 300 by 500 feet were swept by the flames in three-quarters of an hour. The conflagration was of such a magnitude that the intensity of heat was terrific. Girders two feet wide can be seen tortured into strange curves. A few houses survive on the top of Russian hill and Telegraph hill; the Fairmont stands like a great acropolis overlooking the ruins of an ancient city. The few surviving sky scrapers look gaunt and ragged. Distance is killed by absence of landmarks and the erasure of high walls; the City appears to have shrivelled, it seems no distance between points formerly too far to walk. Squares we thought commodious air spaces have dwindled to insignificant enclosures. At a distance the streets meet the sky-line with a slight indent, the roadways make gray bands among rectangles of dark wreckage; a few chimneys stand tottering drearily above the ashes of vanished homes.

After the Disaster.

San Francisco is known to mining men the world over as a delightful rendezvous; from the Nevada deserts, from the Arizona border, from the Mexican ports, from the hills of California, from Australia and the Orient, the seekers after mineral wealth come to the City by the Golden Gate, and there enjoy the rest, the pleasure and the associations that compensate for the weariness of travel and the stress of professional labor. To them it will be a matter of interest to learn how the City looks after having passed through earthquake and fire.

As you cross the Bay from Oakland or Berkeley, the City looks scarcely different; such prominent landmarks as the Ferry tower, the Call building, the Fairmont hotel and other familiar structures are visible, but as you look closer you note the absence of tone; it is all dull. The glory of life has gone, it is a ruin that you see. As the ferry passes Goat island and begins to approach the landing, the destruction becomes apparent. The Ferry building is there with bowed lines that tell of structural injury and the tower appears out of plumb. The flagstaff is bent and the clock still points to the moment when it was shaken to a full stop. It says 5:16, but then the ferry clock never was a reliable time-piece and the quake might well have discovered it one or two minutes fast. The scaffolding around the tower indicates the work of repair; it is doubtful whether it will not be necessary to rebuild at a later date. On emerging from the Ferry building, one was accustomed to the full-toned voice of a big town, intensified by traffic over the cobbles of Market street and the confused shouts of hotel runners, the strident cries of newsboys and the clanging of car bells. All these are silent; the noises are those of a village; the wagons, express carts, and men on horseback partially screen a ghastly background. Heaps of brick and tottering portions of walls stretch far and wide in pathetic desolation; and far above them, like the surviving giants of a mighty forest that has been stricken by fire, there looms the stately skeleton of the Call building and other 'sky-scrapers'—a popular term that has the sound of a sad irony. Most of the streets are blocked with a disorderly heap of brick and iron, although one or two main arteries have already been partially cleared so that it is easy to pass through the ruins.

The effects of the earthquake have been partially obliterated by the conflagration, for the disturbed surface is covered with rubbish and the buildings that collapsed were among the first to burn, with a fierceness of combustion that is readily appreciated when the cause is understood. The shock of the earth tremble broke the gas mains and their inflammable content was immediately ignited by the sparks from severed electric wires. Thus does the complexity of civilization add new terrors and until the aids to material comfort are safeguarded by the inventive genius that created them, man would better live as his ancestors did. Those who live in tents and know no illuminant save the camp fire, would have remembered an earthquake such as that of April 18 only as a dizzy moment when trees rocked and the tent-poles shook. But we live no longer as nomads; we raise structures that go far above the trembling soil. On Valencia street, between 18th and 19th streets, there was a hotel, a large wooden structure. The ground on which it stood sank the height of one story and the building collapsed, killing several people. The site of it is not recognizable, for the fire stripped it clean; but the adjoining tract affords interesting evidence. Valencia street has sunk 8 to 10 feet and looking east over the charred remains of two intervening blocks, one sees another frame building that has lurched like a drunken man. This particular part of the City—on the south side—stands on an old creek-bed that has been filled. Down 18th street also, from Valencia to Howard, the ground has sunk on the north side along the center of the cobble-paved roadway and there is a crack 12 to 15 inches wide along the line of rupture. Neighboring houses show the effects of disturbance. Evidence of a similar kind is obtainable elsewhere in this vicinity and it is noteworthy that the belt of deranged buildings and dislocated roadways follows exactly the line of the filling over the old creek. In another locality, at the southwest corner of the new Post Office, the street and sidewalk have sunk five feet from the building, which stands solid and safe on

its own properly constructed foundations. At the corner of Steuart and Market streets, the roadway has dropped bodily fully five feet while the sidewalk stands at its former level; for the sidewalk and adjoining buildings were built on piles, and the roadway was not. On Van Ness avenue, between Green and Vallejo streets, the asphalt is buckled and cracked right across—east and west— while the flagstones on Green street have slid northward 15 inches over the edge of the curb. Finally, in front of the Ferry building, the ground has sunk three feet and the asphalt is cracked along a line running nearly north and south. These few facts were collected in the course of a four hours' walk and they point to one conclusion, which is confirmed by other evidence not necessary to detail. The site of San Francisco included a large area of made land, reaching from about Montgomery street to the Bay; the city limits also included several swamps and creek-beds, all of which in process of time became filled with the material excavated from the higher ground. These weak spots were largely forgotten by the residents and disregarded by builders, but they are now rendered prominent and their memory is revived, because at such places the lack of special care in construction has caused buildings to collapse. There was no regional subsidence in San Francisco, as far as can be ascertained.

The fire has obliterated much valuable evidence in regard to structural defects in buildings, but enough survives to tell a perfectly plain story. No scientifically designed and honestly built structure was injured by the earthquake; many well designed and dishonestly built structures suffered and many more that were both faulty in design and wretchedly built did collapse. The earthquake is a master inspector; no political pull, no sham masonry, no certificate of an incompetent board of works will prevent the ruthless exposure of bad work when Nature sets about to make a crucial test. And there was lots of dishonest and foolish construction in San Francisco, as there is in every rapidly built city anywhere on this continent or even on some of the others. Of all the architectural frauds in San Francisco, the City Hall stood, as it fell, in a class by itself. During the long term of years occupied in the building of it, the City Hall has enriched a succession of contractors and it was notorious for bad work. It is a sorry sight; the big dome has been stripped of its stone, leaving a bird-cage of steel trusses, the roof has fallen and the walls have crumbled; it looks like the disheveled remains of a doll's house, shaken to pieces. The building that housed the City's administration and should have been an example of architectural skill and artistic taste, has collapsed miserably, because every stone of it was laid in putrid politics; it is a disgraceful ruin, the great dome is stripped of its veneer of stone as thoroughly as the iniquity of the builders stands plain to every beholder. Let the City Hall stay as it is for twenty years, a monument to greed and a warning to dishonest builders—"Lest we forget"; for in the rush and activity of a resourceful community, we are only too likely to discard the lessons of the past, and when the first hurt of the recent blow has healed we shall be in such a hurry as to become again complacent to poor construction and the condoning of dishonest contractors.

On the other hand, the structures erected by the Federal Government have proved their stability and the fact that they were in some cases provided with an artesian water supply also indicates a rare good sense. To these factors the community owes the inestimable good fortune of still possessing a post-office and a mint that can play their necessary part in clearing the confusion of business caused by the recent catastrophe. But there are many other buildings that exemplify the results of good work well done. Most of the tall office buildings, constructed of steel and erected on proper foundations of steel and concrete, have stood the test and will become the nucleus of a new hive of industrial life. Among these, the big Call building stands pre-eminent. To most men it had often suggested the question of safety during an earthquake and of all the proud sky-scrapers it seemed the one that most wantonly braved such a peril. It is sixteen stories high and is surmounted by a big dome that contains three floors more. With a base 75 feet square, it is 300 feet high. Observers have spoken of telegraph poles that swayed wildly and that bent like a reed in the wind; what must have been the swing at the top of that great tower of steel and stone? Nevertheless, there it stands, unscathed, without a visible crack, devastated by the flame but triumphant over the tremblor. Let us feel ashamed of the sordid dishonesty of the men who built the City Hall, but we can well afford to be proud of the scientific knowledge and the honest handiwork that dared—and yet not unwisely—to erect that splendid structure, which looks down today over a world of ruin and inspires the people of San Francisco to the proper recognition of the value of good building construction. Look at this picture and on that! Look down on the ruins of the City Hall and look up to the Call building, standing like a monolith. Now let the new City be built with similar skill and with a like honesty of construction, so that San Francisco shall be the best example of modern methods, a glorious monument to the science of the engineer and the genius of the artist, the home of the Argonauts and the pride of the Pacific Coast.

The Misuse of Explosives.

One feature of the conflagration will interest miners and if they had observed it, we believe that they would agree with us in thorough-going condemnation. We refer to the misuse of explosives in blasting buildings. If it had been planned systematically and carried out properly, much of the City could have been saved, but it was far otherwise. The use of high-grade explosives by people ignorant of their strength and proper application, was instrumental in destroying a vast amount of property without the result desired, and in many cases it actually spread the conflagration. The work was done by Dick, Tom and Harry, until the very end of the operations when the naval officers from Mare Island took a hand and directed affairs in a scientific manner. Before that the police, the militia, and volunteer firemen used a box of dynamite where a pound would have sufficed, they blasted on the wrong side of walls and did such foolish things as placing a keg of black powder in the center of wooden buildings, with the result that they set them afire instead of bringing them to the ground. Spectators could see that the explosion threw up a lot of dust, to be followed forthwith by flame. They dynamited buildings already on fire and simply made an avenue for the spread of the conflagration instead of creating an obstacle to its advance. Under such conditions, the explosion scattered brands right and left On Van Ness avenue there was a deplorable amount of damage needlessly done to handsome frame buildings by the use of black powder, that utterly failed of its purpose. It was the veering of the wind and the persistent application of blankets and sacking soaked in the waters found in kitchen boilers by heroic volunteer firemen that eventually saved the Western Addition. However excusable the poor judgment shown during a time of great strain and excitement, there was nothing to palliate the stupidity exhibited in the attempts to blast dangerous walls when the conflagration was at an end. While such operations were being carried out on Market street, there was danger to anyone within three or four blocks; 150 pounds of dynamite were used where as much could have been accomplished by five or six pounds properly applied. Boxes containing 50 pounds apiece were placed against a wall with a light cover of sand and exploded with needless waste and danger. A drill-hole or two properly pointed would have thrown the wall in any direction desired. There was plenty of time to do it properly. A glaring example of such blunders occurred at the Post Office several days after the conflagration; this building was hardly injured by either fire or earthquake, but when the amateur blasters came on the scene, they nearly wrecked it in their childish efforts to pull down the walls of the neighboring Odd Fellows building. It is officially stated that the foundations of the Post-Office were hurt by the blasting and the south side was so wrecked that the damage is estimated at $100,000. It might be supposed that with so many experienced mining men in the community, it would have been possible to get their help in work which they understood and we can state that several of our friends did volunteer to give suggestions and to proffer systematic aid, but in vain. It is difficult to persuade a man that he does not understand what he is doing. San Francisco has reason bitterly to rue the misuse of the explosives that properly employed have proved so powerful an aid to the advancement of mining.

The Effect in Mines

None of the mines of the Pacific Coast suffered from a movement of rock. A day after the earthquake we wrote to the superintendents of a dozen representative mines asking whether they had observed any effect underground. The replies agree in a distinct negative. In the foot-hill region of the Sierra Nevada, the shock was felt only slightly even by those on the surface, while in the mines all was as usual, the occurrence passing unnoticed. At the Great Eastern quicksilver mine near Guerneville, three men were killed by a falling mass of rock that was loosened in the shaft and this accident occurred at the moment of the earthquake, but it has no bearing on the matter. The slight tremor precipitated a loose piece of rock that probably was about to fall and would have fallen a little later, in any event. At the time of the San Francisco disaster, an Associated Press telegram from Houghton, Michigan, announced that the earthquake had caused a collapse of ground in the Quincy copper mine, killing two miners. This also has no connection with the San Francisco earthquake, or any other such phenomenon. The copper mines of the Lake Superior region, more especially those having a large area of excavated ground, are subject to a sudden collapse of stopes, producing shocks that are felt keenly at surface. They are termed 'air-blasts', because they are accompanied by a violent expulsion of the air displaced by the falling rock-walls, producing reverberations similar in a way to those that follow a dynamite explosion. The causes of them were discussed in these columns not long ago and we can only repeat that they have no connection with earthquakes. All the evidence goes to show that as regards earth tremors, the miner is safer underground than the people in the city.

Earthquake Lines.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

California geologists have long since agreed that the frequent earthquake shocks felt in this State have their origin along well-defined lines, some of which are known. Of these several lines of weakness and disturbance, the most important and interesting is that which passes in the vicinity of San Francisco.

Mountain ranges, broadly speaking, are built, either by the outpouring of volcanoes; the carving out by erosion of elevated plateaus, or by the slow, long-continued uplift of elongated rock masses due to the interior shrinkage of the earth, which causes wrinkles, as it were, to form on the surface. The first may be violent and spasmodic, like the recent eruption of Vesuvius, or the demonstration may be quiet, unaccompanied by explosion or destructive earthquake shock. Some of the volcanoes of the Hawaiian Islands are of this type, the lava quietly rising in the crater until it runs over, a molten stream, which flows down the mountain side. The erosion of an elevated tableland representing the second type, may proceed for thousands of years in a comparatively quiet way, gradually carving canyons and gulches in the rock-mass, tending constantly to reduce the elevation to the base level of erosion—the sea level. The third may also be of long duration, progressing so slowly that little or no change is noticeable during a century, but in time producing a marked topographical effect. This movement of the earth's crust is accompanied by occasional re-adjustments of the rock strata, producing what are really only minor tremors of the surface, but which are often fraught with the most serious consequences to mankind, particularly those who chance to dwell in the vicinity of the line of disturbance—the earthquake line.

THE RUINS OF THE CITY HALL, Showing Effect of the Earthquake.

This uplift of a region usually causes strains which pass beyond the limit of elasticity of the rocks, and a rupture results. If the strains continue a fault or displacement takes place, one side of the fracture sinking relatively to the other, and in time—a very long time—the rising side becomes a mountain range. Ordinarily, so slow is this uplift and readjustment of the moving mass that erosion destroys, or, at least, greatly modifies the abrupt scarp which would otherwise result if the movement were quickly accomplished, until no one but the geologist would notice the displacement or understand its significance. The great Sierra Nevada of California is a magnificent illustration of mountain building by faulting, and the subsequent modification of its topography by erosion. The west side of the Sierra is a long, low slope, extending from the east side of the great interior valley of California from 100 to 500 feet above sea-level to the crest of the range, reaching an altitude of 10,000 to 14,000 feet, though probably originally much higher. Its east slope is almost precipitous, descending rapidly to the floor of the Great Basin in Nevada. That line of weakness is also an earthquake line, and some very heavy earthquake shocks have been felt in that locality within recent time, notably in March, 1872, when a terrific shock did much damage in the Owens River valley. That shock was felt for hundreds of miles, but did not extend as far west as the Coast range.

It is the occasional sudden readjustment of the slowly moving rock-mass that causes the shock, and regions along these lines of weakness and displacement are therefore subject to earthquakes. No one can predict their coming or foretell their intensity. It is only safe to say that they are likely to occur at any moment. The more frequent they are the less danger there appears to be of destructive shocks. Almost invariably there is a series of shocks, of which the first is the most violent.

The causes which in past ages have built up mountains and formed valleys, are still at work in exactly the same manner and will continue, as they have, since the dawn of creation, and the recognition of an earthquake line, merely means that geologists have discovered another mountain range in process of formation.

The San Francisco earthquake line approaches the State from the northwest, coming from beneath the Pacific, reaching the mainland near Point Arenas, in Mendocino county, and follows down the coast; it has probably influenced the shape of the shore in that vicinity. It enters Tomales bay, in Marin county, and following that shallow sheet of water to its head, crosses a low divide to the head of Bolinas bay. The depressions occupied by these two bays are undoubtedly due to the fault-fissures. From the mouth of Bolinas bay the line extends out southeasterly into the Pacific again, reaching the coast near Mussel Rock, in San Mateo county, several miles below the Cliff House, and passing inland through Lake San Andreas, Crystal Lake and southeastward through Los Gatos, Loma Prieta, near Santa Cruz, Pajaro, San Juan, lower San Benito valley, Peach Tree valley, Stone Canyon, Chalome valley, Carrisa valley, west of Sunset six or seven miles, through the west fork of San Emedio canyon, crossing into the Mohave desert west of Lancaster, in Los Angeles county, and continuing in a generally southeasterly direction toward the Gulf of California.

Throughout this entire distance of nearly 600 miles this line of movement may be plainly traced by a succession of valleys, lakes and landslips. In several places the fault-throw exceeds 2,000 feet by measurement. It is thought that the fissure has an easterly dip and that the hanging-wall side is sinking relatively to the foot wall or westerly side; it is a normal fault.

The fissure in Marin county may be plainly seen and followed for twenty miles, where it is as well defined as a road, and in some places resembles a railroad cut. Since April 18, the ground has cracked open, bulged up or settled, and springs are flowing where none existed before. There seems to have been a very pronounced horizontal movement, in this locality, to the extent of at least 12 ft. A causeway, solidly built, across the line of faulting was broken and thrown the distance stated, the west side going to the north. Buildings constructed on the line of the earthquake were wrenched apart by this horizontal movement, one being a large barn, owned by a man named Skinner, the other being Shafter's creamery. In that district, as elsewhere, the greatest damage was done to buildings cheaply constructed on insecure foundations. Most of the wooden structures destroyed, with the important exception of the two above mentioned, were built on stilt-like timbers from one to four feet high, without diagonal braces, and the buildings were simply thrown a distance equal to the height of the underpinning. The villages of Tomales, Olema, Bolinas and Inverness were completely destroyed and a tidal wave is said to have swept Tomales bay, which is a fan-shaped sheet of water having its broadest portion opening into the ocean.

Former Earthquakes and Their Discarded Lessons.

From 1865 to 1869 San Francisco and vicinity were repeatedly visited by earthquake shocks, some of them severe. One of the most serious of these disturbances occurred on October 22, 1868. THE MINING AND SCIENTIFIC PRESS of October 24, 1868, contains the following account of an earthquake that visited San Francisco two days previous. Some of the facts stated bear a remarkable similarity to those observed recently.

COLLAPSED BUILDING ON MADE GROUND.

As to facts, they can be condensed into a few paragraphs: Time, 8 A. M., October 22, 1868; direction variously apprehended, but pretty positively either from southeast to northwest or the reverse; buildings generally having been thrown toward the southeast; motion of the surface during the severest shocks more

horizontal than vertical, but in some of the subsequent tremblings almost perfectly vertical; size and height of the earthquake waves, and direction and degree of the force relative to the earth's center unknown, for want of proper instruments to record the same, and comparison of observations in different localities; duration of the principal shock, about 45 seconds; weather dead calm and foggy in town, at Point Lobos a light breeze and hazy, as it has been more or less for weeks; thermometers and barometers about as usual. In the evening the air became beautifully clear and invigorating. The reported focus of severity and damage was, according to many observers, not far from Haywards, in Alameda county; it is safe to say that it was within a radius of 16 miles from that place. As to the degree of damage done to property, it can be understood only by taking a walk through town and observing the houses, walls, cornices and copings that have been thrown down. Probably not over a dozen buildings were utterly destroyed, but hundreds were left with marked evidences of injury. Lives lost, so far as reported at the coroner's office, six; wounded or hurt, about four dozen. Whether the rumbling sound accompanying the earthquake proceeded from the interior of the earth, or from the motion of the loose bodies on the surface, was not apparent, but was settled both ways, by guess."

In the issue of November 7, 1868, appeared the following advice, by George Gordon, on construction of buildings:

First.—That extreme care be taken with foundations, no matter whether on solid or made ground: let the entire bed-frame on which the building rests be a unit, like a ship's keel, and strong enough to bear twice the weight of the building if set up on posts ten or twelve feet apart, and so tied together that you could lift it bodily by a derrick and swing it about.

Second.—Dispense with the use of brick, stone or cast iron, except as an exterior protection against fire. Give these materials nothing else to do.

Third.—Rely on timber and wrought iron entirely to carry the load and resist motion. Mortise all timbers and rivet all iron. Use boiler-plate with angle-iron riveted to it above and below all openings, as sills and caps. No form of iron procurable in this market is so simple, cheap and strong as these combined.

Fourth.—Dispense with lath and plaster, and face the inside walls, and make the ceilings with tongued and grooved lumber. Put up every board and lay every floor so as to form diagonals—bracing in every direction. In nailing, put every nail squarely through the face of the boards and discard the carpenter's foible of blind nailing.

Fifth.—The lower the ceilings and the more numerous the rooms in a building, the stronger the structure. * * * * It is certain that entire safety may be assured to life and property on solid ground by proper attention to the construction of buildings, though we should have earthquakes as severe as are recorded; and it is as certain that all improperly typed walls, or poor mortar and poor bricks, will be tumbled down to the peril of human life, as that earthquakes will occur as they have in the past. Especially should all walls with fronts veneered with stone be immediately taken down. It is mean and cowardly to patch up these structures and plaster up the broken chimneys, trusting that the shock that will hurl them to the dust will not come in your time, or until you have sold the property.

A book published in May, 1869, entitled "Rowland's Earthquake Dangers, Causes and Palliations," contains the following introductory paragraphs:

Truth compels the admission that a portion of California, including the locality around San Francisco, is, at indefinite periods, subjected to the action of earthquakes. It fortunately so happens that the physical geography around this city is of such a character as to largely modify, if not wholly obviate, many of the dangers which are found sometimes to occur when earthquakes take place at or near the seaboard. Allusion is more particularly made to earthquake (tidal) waves and landslips.

The first is found not generally destructive, excepting in the case of harbors immediately open to the ocean, or near the debouchure of bell-mouthed rivers or bays. Landlocked as the harbor of San Francisco is, even if an earthquake ocean wave 60 ft. high was to break on the outlying western shore, it could only penetrate into our harbor by the width of the narrow passage of the Golden Gate, and as it rapidly expands after its entrance to the north, south and east within a short distance from the narrowest part, and would have to travel some miles before its effect could be felt in San Francisco, ere its arrival at that point it would be much modified by the resistance it would have received.

The other danger we are not likely to encounter to any ruinous extent, is that which might probably arise from landslips, notwithstanding the extension of the city front into the bay from time to time, through the interested influence of speculating land-grabbers with former legislatures; as much as possible has been accomplished to bring about so undesirable events as landslips. Owing to the fact that our bay is a comparatively shallow one, we are not likely to witness a newly and solidly constructed wharf, as in the case of the earthquake at Lisbon, destroyed and replaced by deep water in consequence of a landslip. Though partial fissuring amongst the unstable ground of our water lots may take place, and irregular shrinking and elevation of foundations so situated may occur, sufficiently so as to be calculated seriously to damage massive and elevated brick or stone structures which may be erected on such made and generally unconsolidated ground; but a serious landslip need not be apprehended.

In fact, as is well known to its residents, the damage caused by earthquakes at San Francisco and around its bay almost wholly took place on alluvial soil, or made ground, as at Lisbon, the South American cities, and many other places; the next greatest amount of damage having occurred where buildings had been erected on foundations most nearly allied in character to those just noticed.

Scientific Blasting.

(Reprinted from the MINING AND SCIENTIFIC PRESS of August 26, 1905.)

Occasionally miners are required to perform difficult blasting operations, where buildings, flumes or other structures in the vicinity are endangered and must be protected. Experienced workmen can usually overcome these difficulties by the judicious pointing of holes and by the careful use of powder. Not long since, in a city which it is needless to name here, it became necessary to remove a number of concrete piers which had been constructed in the basement of a large brick building. These piers were foundations of large size made from the best material by competent engineers, and had been placed in position as foundations for heavy machinery and had been in use for more than ten years. It became necessary to remove these foundations, and it goes without saying that it had to be done without injury to the building. The foundations were built on a concrete floor and extended upward to about the level of the main floor of the building—the street level. For a day or two, men were engaged in the attempt to remove these concrete piers with picks, hammers and gads, but they made most discouraging headway. One of those interested made inquiry of an expert miner, H. P. Gordon, and asked if the foundations could be mined or blasted out. Mr. Gordon examined the proposition, felt satisfied the job could be done and accepted the contract. After drilling two holes and firing them, there seemed to be no longer an experiment in the proposition and the contract was undertaken. For a period of 35 days, from four to seven miners were employed under his direction in drilling and blasting these concrete piers. In addition to these miners, a crew was employed sledging the larger pieces of concrete and in shoveling the debris into wagons. During this time a total of 470 holes were drilled in the concrete, the most of them being 30 in. deep, a few of them being short block holes; 1,600 ft. of fuse, 170 lb. of No. 2 dynamite and 470 detonators were used. The result of these municipal mining operations was 740 wagon-loads of broken concrete, about 2,220 tons. The work was continued to a successful conclusion, no damage whatever was done, and these unusual operations did not even attract the notice of the passer-by nor of those occupying the neighboring buildings. All work was done during the day, the blasting being accomplished whenever the round of holes was ready. As no permit was obtainable for work of this character, it had to be done secretly; but no unusual precautions were observed. The holes were well tamped with moist clay and each hole was loaded with nearly one and a half sticks of powder, the block holes requiring less.

The success of this operation shows that blasting may be successfully accomplished without damage within the limits of a metropolitan city if the necessary care is exercised in the work.

Drilling along the new iron range west of Duluth has progressed so favorably that both the Pickands-Mather and the United States Steel Corporation interests are putting down shafts. The ore occurs in large bodies, and is of moderate grade, but lies too deep for stripping and hence can not be mined as cheaply as on the Mesabi.

Illusions in the Mining Field.

Written for the MINING AND SCIENTIFIC PRESS by A. LAKES.

Nature is both elusive and illusive. She seems to like to deceive us and crack jokes at our expense, hence the appropriateness of the term lusus naturae, or sport of nature. Every geologist must have met with some of these illusions in his field experience, hence I may be permitted to recall a few that came under my own observation. I remember at an early period in my geological career, digging in some Tertiary formations characterized by fossil leaves and lignite coal, and finding rounded masses which had so close a resemblance to certain fossil corals that I thought I could even name the species to which they belonged. On sending them to a well known paleontologist he pronounced them to be concretions of clay of the kind known in Germany as "teuten." A little later I discovered and sent to an Eastern fossil collector, whose specialty was corals, the stump of a palmetto tree, such as is not uncommon in the Tertiary beds of the table mountains of Colorado, and is there associated with fossil nuts and palm fronds. He wrote to say that we were mistaken as to the fossil being that of a palmetto. It was a coral of Silurian age; and he named the genus and species to which it belonged!

In making the geological survey of a range of mountains in Colorado I came across a belt of limestone, the age of which it was important to know. Fossils, therefore, were eagerly looked for. One day an outcrop of this rock was found, apparently studded with large fossil corals. The specimen was sent East to an eminent paleontologist, and the corals proved to be inorganic concretions in the rock. On another occasion, in Idaho, a belt of rock was found that seemed to settle the disputed age of the formations of that region, by its being profusely spotted with large round spots showing the radiate structure of Paleozoic corals such as those of the cyathophylloid family. The formation was provisionally dubbed Lower Carboniferous limestone. Later experience with the same rock in other parts of the field showed these forms to be those of some radiated silicate mineral of inorganic origin. Moreover, acid proved the rock not to be a limestone but a quartzite.

Noted scientists may sometimes have their illusions. The first discovered horns of the great Cretaceous dinosaur triceratops were supposed by one paleontologist to be the horn cores of the great prehistoric bison. Another equally noted paleontologist was accredited with mistaking the cervical for the caudal vertebrae of a gigantic sea saurian, and in his restoration he placed the head of the animal on the end of its tail. Imagine the wrath of a great sea dragon on awaking from his millenial sleep and finding his head stuck on to the tip of his tail!

If such eminent doctors have their illusions, a wide margin must be allowed for those who have not made geology or mineralogy a special study when they tell of discoveries of petrified rattle snakes, eels, terrapins and cocoanuts, not to mention petrified human corpses and human remains, even in solid granite; also for the prospector in the mining field who says that his prospect hole is in phonolite and contains iridium, tantalum, uranium, tellurium, nickel, cobalt and tin, although to you it may appear to contain only straight hornblende schist.

Igneous rocks are apt to be confounded with those of true sedimentary origin and vice versa. In the early days of the Leadville discovery a whitish gray rock, laminated, crystalline, and apparently stratified and covering large areas, was at first taken for a quartzite of sedimentary origin. An Eastern petrographer, who had never seen the behavior of the rock in the field, from microscopic examination alone, pronounced it also a quartzite, necessarily of sedimentary origin. Later field observations showed this rock to occur as an igneous dike and intrusive sheet, cutting up through the other formations. It now is well known as the "white porphyry;" it is quartz-felsite, and is intimately connected with the ore bodies of Leadville.

Illusions are apt to occur also in stratigraphical and structural geology. In the South Park range there is a remarkable arch visible from a great distance, and locally known as the Horseshoe. This has been pointed out as an example of a symmetrical anticlinal fold. It is simply a body of limestone and quartzite forming the sloping flank of the range which has been eroded into an amphitheater with walls in the form of a horseshoe. The dip and strike of strata viewed from a distance are often as illusive as the familiar example of an irrigating ditch cut along the side of a mountain that appears to carry its water up hill.

In the mining field illusions often occur as to the real size, thickness and position of veins. In one case, responsible parties reported a gold-bearing quartz vein of almost incredible thickness, but examination proved it was a vein whose slab side, exposed by erosion, formed the flank of a mountain. The real thickness was only a foot or two.

In the Carolinas and other Southern States, owing to the country not having suffered from the effects of the great Northern ice-sheet, erosion of rocks and veins is gradual, and it is not uncommon to find the ruins of a vein lying, like those of a fallen wall, close to the present outcrop. So orderly and closely parallel and continuous were these fallen blocks of quartz in one instance that came to my notice, that the thickness of the vein measured across its strike was estimated at 100 feet. A tunnel driven below, where the vein was unbroken and in place, found its true thickness to be only ten feet.

Re-duplication of the outcrop of a vein along a steep hill side by local faulting is often a fertile source of illusion, resulting in long cross-cut tunnels being driven in expectation of intersecting several parallel veins. The dip of a vein outcropping on a side hill is often illusive and in an opposite direction from that subsequently determined by development in depth. The idea that huge quartz veins are necessarily valuable and productive in proportion to their width and length, is an illusion that can only occur to the novice in the mining field.

That the archaeologist, as well as the geologist, has had his illusions from the days of the Pickwickian "Bill Stumps his mark" to the present is exemplified by a man who told me that in digging a well he had come upon a deposit of petrified wood and bones (presumably human) and amongst them a petrified grindstone!

The recent catastrophe in California demonstrates once more the superiority of the miner's product as a medium of exchange. Thousands of dollars of paper money have been lost to the owners; and not only this, but those same thousands have been presented to the banks that issued the money. When a paper bill is destroyed the owner loses and the bank that issued it gains. The destroyed bill can never be presented to the bank for redemption.

State Geologists.—At a meeting held at Chicago on March 31, an organization was effected of the State Geologists of the Mississippi Valley. Messrs. Lane of Ohio; Norwood of Kentucky; Blatchley of Indiana; Buckley of Missouri; Haworth of Kansas; Bain of Illinois, and Assistant State Geologist Bownocker of Ohio, were present. W. S. Blatchley was made chairman and H. F. Bain secretary. It is proposed to arrange for field conferences from time to time and for the frequent interchange of reports and notes of progress among the members of the association. It is expected that through friendly criticism and advice the work of the various surveys may be unified and improved.

A Story in Stone.

Written for the MINING AND SCIENTIFIC PRESS by T. A. RICKARD.

Look at it for a moment. Nearly oval in outline, warm gray in color, it has a surface of irregular texture suggesting that it is composed of minerals of different hardness which have been worn unevenly. It is a piece of granite. Without the aid of a magnifying glass you can see the clear blue-gray of the grains of quartz, the pink-white of the particles of feldspar and the shifting gleam of the bright spangles of mica. It is a waif from the mountains that overlook Denver, in Colorado; a stray bit of stone that was out of place on the tennis court where I picked it up, several years ago. Investigation proved that it came thither amid the sandy loam employed in preparing the smooth surface necessary to the finish of a good tennis court. The material used for this purpose came from certain excavations in a neighboring street where a successful mine-owner was building himself a mansion. Originally, long before Denver existed, even before the buffalo or the Indian roamed over the prairie, this pebble was swept down from the mountains by the flood-waters of the river Platte, which in receding, left the deposits of sand and clay now forming the foundations of the city. As a child wandering over the beach, picks up a shell and putting it to her ear, listens while the wind plays through the delicate portals of pink and white, and hears a voice like the murmur of the sea that tells of strange things far beneath the wave, so we also may listen while this pebble mutters to us garrulously, and tells of its distant home and future destiny. If time can bestow nobility then indeed this bit of stone may command respect. The life of a generation is to the age of this pebble as a dewdrop to the sea. When the morning stars sang together, it held up the foundations of the round world; and when man was yet an unthinking savage, it crowned the crest of the mighty mountains. Its birth belongs to the beginning of days and its childhood was chilled by the cold of the earliest dawn. To trace its origin we must penetrate through the mists of a dim remoteness guided only by that fairy of science which men call the constructive imagination. We judge of that which has taken place long ago by that which we see occurring today. The surface of the earth is the playground of a number of natural forces which have been at work since the beginning. The intensity of their activity has varied, but the method of their manifestation has been the same, because they are the expression of definite laws. Thus it is that the unseen frost which cleaves the mountain summit, the torrent that sweeps the shattered rock into the river which bears them onward, to lay them in the quiet depths of the ocean, indicate to us today how this pebble was formed in the ages past, when that mountain was an island and that river as yet unborn.

Draw back the veil of ages and look at the Earth as it was in the morning of time. A heavy silence broods over the dim vastness of the ocean; upon the frowning coast no bird sings and no flower grows; the winds wander over the leafless lands and stir the waters of desolate seas. There is no life, there is no sound of man or beast, there is naught save a weird expectancy that fills all Nature as in that hour when the darkness is paling before the whispering of dawn. The earth is very still, like an infant asleep. Into a quiet inlet a streamlet is falling. It is singing to the sleeping earth, telling it of the days to come when the great silence shall be broken by the voice of man, and life shall fill alike the darkling wave and the sunlit field. The waters of the streamlet mingle with the sullen surges, and bring to them the tribute of the river to the sea; not gold or silver is it, but grains of sand and bits of rock borne downward from distant hills. At times, when the wind blows and the rain falls heavily, the waters are deeply laden with dark clouds of silt and hasten to the sea as though eager to be unburdened. The sand, the bits of rock and the burden of mud are each delivered to the ocean, to be deposited in ordered sequence upon its outspread floor. This was the seed-time when were laid down the unlike particles which Earth's alchemy should eventually transmute from silt and sand into crystalline granite. The epoch of which I speak is the oldest of which geology takes cognizance, it is vaguely called Archean; so remote is it that no trace of even the elementary forms of organic life have survived, if they existed; so distant that man was not, nor was the footstep of his oncoming heard; so long ago that Time, like the schoolboy who rubs the figures off a slate, has passed his obliterating hand over the faint record written on the rocks and left no sign behind. The record has indeed been rubbed out, but modern inductive science can restore the writing. We observe Nature's handiwork today and thus infer her method in that geologic past. This is the key to all geological research.

To return to our story. The burden of the river was laid down upon the bed of the sea. More material of the same kind covered it. This process of deposition and accumulation went on for a period to measure which the years are useless as units. It took place with the patient slowness that ever seems so admirable to man, whose brief life is but a span, whose existence one unseemly haste. The filling of the ocean by the waste of the land is a matter of every-day observation. The transfer of rock to the sea, by rain, rivulet and river, has been the subject of careful investigation and measurement. By estimating the quantity of sediment carried down to the sea by such rivers as the Mississippi, the Rhine, and the Ganges, it has been determined that the level of the surface of the continental areas is being lowered at the rate of one foot in six thousand years. This estimate takes account of only such material as is transported mechanically by the rivers, and to this must be added an amount, nearly as large, carried in solution. The latter consists mostly of lime, which, being secreted by the multitudinous minute organisms of the deep sea, eventually leads to the building up of the huge thickness of limestone rocks so characteristic of lovely mountain-lands, such as Derbyshire and Savoy.

THE PALACE HOTEL AFTER THE FIRE.

GETTING A DRINK FROM A FIRE HOSE.

Thus an enormous depth of sediment was gradually laid down, covering those earlier silts and sands, wherein lay the elements of the pebble. The deep canyons of Colorado, made by the mountain torrents, afford natural sections of the earth's exterior and make it evident that the granite of the Archean period was overlaid by other rock-masses several miles in thickness. At no one place do we see the complete succession of sediments, because wind and water, rain and snow, have been at work wearing them away during the ages that have passed since they emerged from beneath the wave; nor do we find a simple horizontal bedded series of them in any place, because of the twisting and tilting which they have undergone. This folding is due to the cooling of the earth's exterior and can be explained on the rough analogy of an apple, the skin of which shrinks and crumples as it dries. Thus the granite from which the pebble came, was formerly covered by a thickness of rock exceeding the height of our highest mountains. Such a succession of sediments could not be laid down unless we suppose the ocean-floor to have sunk at a slow rate at least equal in amount to the rate of the deposition of the material. Otherwise the filling of the basin occupied by the sea would put a summary end to the process of accumulation.

Such a supposition is borne out by evidence obtainable today. Proof of a depression of certain parts of the earth's exterior is to be found in the submerged forests which occur, for instance, along the east coast of England. It is but a geologic yesterday (the Pliocene period) that the Rhine flowed across (what is now) the bed of the North Sea and emptied itself within British boundaries. Conditions such as have been described, prevailed in the particular case we are considering. The floor of the Archean sea sunk slowly, while a great thickness of sediment was deposited. The lowermost layers became hardened and consolidated by the weight of those above them. The material destined to make the pebble, lay buried in the darkness of the underworld. Heat and pressure transformed the soft silt into crystalline rock. The transformation was brought about with an infinite slowness and amid an obscurity into which science cannot quite penetrate. We do know that at great depths below the surface of the earth, the temperature is very high. This fact has been indicated by observations made in the sinking of shafts and wells. The average of a large number of careful determinations proves that there is an increase of one degree Fahrenheit for every 48 feet of descent. At a depth of less than ten thousand feet we would therefore find a temperature equal to that at which water boils at sea-level. At the same horizon the pressure from the overlying rock-masses would be equal to about 4500 pounds per square inch. It is certain, moreover, that the rock which, in the after ages, gave us this pebble, was at one time buried under a thickness of sediments far exceeding that just mentioned.

Thus long ages followed each other. The depression of the ocean-bed ceased, and deposition came to an end. A movement of elevation began. Somewhere else, doubtless, a sinking of the earth's exterior helped to counterbalance it. Nature knows not idleness. Upbuilding compensates for destruction, distribution corrects excessive accumulation. Islands commenced to dot the wide expanse of the ancient sea. The material of the pebble, however, was yet far beneath the waves and formed an humble part of those islands that in time became the summits of the mountain range which now keeps guard over Denver. The slow elevation of land continued. As the sea receded, the islands grew both in number and in size until at length they were united into a large mass of land. The evidence of the elevation of parts of the earth's surface is similar in kind to that already given in support of the statement that depression takes place elsewhere. The Pacific side of South America is rising at the present day. On the coast of Norway, at an elevation of 600 feet above the sea, there exist terraces which, from the evidence afforded by the marine shells that they contain, have been proved to be raised beaches belonging to a geological age approaching our own times. Observations have shown that the Scandinavian coast is being elevated at a mean rate of 2½ feet per century. The maximum rate, at the North Cape, is nearly twice as much. Similarly, the land of the Arctic region is also undergoing rapid emergence from the sea.

In this way the land gradually made its appearance above the face of the waters. During this long time of waiting the particles of the pebble had been subjected to the silent forces continually at work in Nature's underground laboratory, so that from sand had come crystalline quartz, from shapeless mud had sprung clear flakes of mica, and out of disordered silt there had been formed an orderly arrangement of elements composing crystals of feldspar. The rock had been prepared with an infinite patience for that later day, when, from lying buried in the footstool of the earth and hidden in the gloom of the ocean depths, it should stand on the top of the wrinkled hills and crown the very summit of the mighty mountains.

Then at length, the rock of our pebble emerged from the sea. As soon as the land arose above the ocean there began that wearing down of the rocks which we term erosion. Tearing down and building up go hand in hand in the inorganic, as life and death in the organic, world. The wind and rain, the frost of night, and the heat of day, were the agents which slowly removed the upper portions of the successive beds of rock which still covered the material of the pebble. After an interval of comparative repose the movement of elevation re-commenced. The island became a continent, the hill became the crest of the mountain range. The sun and snow, the ice and rain, are the patient tools that sculpture the shapeless mass of rock and chisel out the mountain's form. Our pebble became part of a granite peak. There it remained for untold years, a portion of a solitary pyramid of stone, day after day throwing the same clear shadow across the waste of waters, while the centuries went by as the unregarded sand that is tossed by the wandering winds of the desert.

Time, an ocean of time, flowed by. The vast duration of many a geological period passed away. The waters still washed the eastern side of the mountains and the sovereign desolation of the sea covered the prairies of Colorado and Nebraska. Even today if you ascend the Front range and look to the east, the unbroken line of the horizon and the witchery of distance will change the dull dreariness of the plains into the ocean's alpine azure.

At length, in that comparatively recent period known as the Cretaceous, the elevatory movement culminated and the granite peaks gained their maximum height. The sea so long at their feet receded, and its floor became a level plain. At a much later period, however, at a time when the Rhine flowed through the eastern part of England, the depression of a certain portion of this area resulted in the formation of a great freshwater lake which overspread the present site of Denver. Think of it as it was then, a wide waste of waters that in storm dashed vainly against the battlemented cliffs that now overlook the towns of Boulder and Golden, and in calm, reflected the severe grandeur of those peaks which were the silent sentinels that guarded the treasures of Colorado when the Spaniard came, and are now the minarets of snow that end the picturesque perspective of Denver's streets.

The material of the pebble still rested on the mountain top. It typified those things which out of weakness are made strong. What was once soft sediment had become crystalline rock; once abased in the deep, it was now exalted above all the earth and "out of the substance of it the axe of God had hewn an Alpine tower." Long ages it stood on high, fronting the dawn and glowing in the sunset; beneath it the mighty hills bowed in serried lines, and far below the prairies faded away in tremulous blue.

But its destiny was yet unfulfilled. There came a day when a mightier power than the storm, a more resistless force than the wind tore away a fragment of that mountain peak and the original of this pebble rattled down the dark ravine and fell upon the snowy surface of a majestic glacier. A drop of the rain of heaven had found a resting place in a cranny of the rock, the cold of night and the heat of day had alternately contracted and expanded this particle of water, so as to make it a resistless lever which had wrenched the stubborn rock and sent the fragments headlong down the cliff. There is a lesson here. The natural forces which command our attention, are not the mightiest. The unseen hand of the frost is tenfold stronger than the raging torrent. Many a volcano in its sudden and catastrophic outpouring of molten rock fails by such fitful activity to eject as much material as the thermal spring whose stream, bubbling daily for centuries, delivers an unvarying quantity of salts dissolved in its beneficent waters. The daily tribute seems insignificant, but the total is more than the outpouring of a Vesuvius.

The glacier received the stone and carried it forward in majestic advance through the long files of onlooking mountains, until, at the opening of a sunlit valley it was delivered to the stream, the waters of which were fed by the melting ice. Borne along, now more rapidly, partly pushed and partly carried, it became worn by attrition so as to lose its sharp edges and to assume its present shape. The chip of rock broken from the mountain crest became the pebble of the stream. Rest it had none, continually traveling onward and downward, sometimes lingering at the bottom of a quiet pool while the trout darted past, sometimes making sweet music as it played among the harpstrings of dark water that fell down the sunless ravine, but journeying ever onward to fulfil its destiny.

The mountain torrent delivered it to the river; the Platte received it, and bore it to the plain.

Then came a day when the heavens were darkened by hurrying stormclouds, when lightning flashed from peak to peak, when floods of warm rain fell upon the snowfields and every rivulet became a river, every river a boiling torrent, when a great rush of water swept down from the mountains and spreading over the plains, covered them with the sand and gravel in which our pebble was found.

But the end is not yet. That pebble, like all created things, has a course to run and a destiny to fulfill. It must return to the condition from which it came, and so complete the cycle of change. We cannot stay its wandering, we may put it on a shelf or throw it into a corner, but it will fulfil its purpose nevertheless. The day will come when we shall be deemed "ancients of the earth," and this geologic age in which we live will recede into the distance to become the "morning of the times" to those that follow. Then this pebble, shivered by the frost of night and shattered by the heat of day, will again be resolved into fragments, to be gathered by the rain and given to the river; and the river will bear them to the ocean where they shall again "sow the dust of continents to be."

This ends the story. There is poetry even among the pages of geology. The history of this globe of ours is a grand epic the cantos of which cover geologic periods of vast duration. The ancients felt this, for they loved to speak of the earth as a sentient being whose changes were typified in their own lives. Much of that simple feeling has come back to us in spite of the artificiality of modern days, and has been voiced by the great poet of our time.

"There rolls the deep where grew the tree,
O Earth, what changes hast thou seen!
There where the long street roars hath been
The stillness of the central sea."

The production of spelter in 1905, as given by Charles Kirchhoff, of the United States Geological Survey, was as follows:

States.	1900.	1901.	1902.	1903.	1904.	1905.
Illinois and Indiana	38,750	44,896	47,096	47,659	47,740	46,606
Kansas	62,136	74,240	86,564	88,388	107,048	112,974
Missouri	14,741	13,083	11,087	9,994	12,150	11,844
Colorado				877	4,871	6,599
East and South. States	8,259	8,603	12,180	12,301	14,893	24,513
Total	123,886	140,822	156,927	159,219	186,702	202,586

Platitudes are a stumbling block to the shallow novelty hunter, and axioms are a weariness to the multitude; but to the earnest they are the renewal of wisdom every morning; they rekindle and illuminate the common sense of humanity which at times burns very low. Those which we have considered are among the most helpful. Three things are vain in our university life: faith without works, morality without religion, and precept without example. All our investigating and teaching and professing; all our sapience and assurance and mannerisms, will go for naught without a labor which is worship, a sympathy which is self-denial, and permanent standards which we adopt only for the better realization of the ideals which they express.—William M. Sloane at Columbia University.

Concrete. The proportions of materials used in making concrete vary according to the use to which it is to be put. It ranges from one part cement, to two to four parts clean sand, and four to ten parts clean crushed stone. If mixing must be done by hand, (a good automatic mixer is preferred) it should be done in the following manner: The sand and cement must be thoroughly mixed dry, then sufficient water added to make a plastic or wet mortar, and the whole thoroughly mixed again. The stone having been previously wet down, should then be added, and the whole mass mixed until every stone is completely covered with mortar. The concrete thus mixed should be immediately placed in position and rammed until excess mortar shows over the entire surface. Where surfaces are to be exposed, either a facing of one cement to two of sand must be used and placed in position as the mass of concrete advances, or else the cement should be forced back by pushing down flat-bladed shovels along the face of the form, thus allowing the richer mortar to run in next the form which makes a smooth impervious surface. No concrete which has attained a partial set in the mixing bed should be used.

Perspective in Mining.

(An Address to the Engineering Society of Columbia University.)

Contributed to the MINING AND SCIENTIFIC PRESS by J. PARKE CHANNING

The melancholy Jacques in 'As You Like It' says, "Call me not fool till Heaven hath sent me fortune." Call me not fool till Fortune hath sent me the opening up and equipment of a mine; for in mining there is so much that is not teachable, nevertheless learnable, that unless a man has this instinct, inherent in all capable persons, he can never hope to achieve success as an engineer. Each mine is, so to speak, a law unto itself, and not until the engineer recognizes this can he get true perspective in mining.

When you leave school and start out in practical life there are certain things that you have heard in your studies which have impressed themselves upon you. The reason for that impression would be hard for you to say. It may be that some particular thing had interested you because of some previous experience of yours. As a result you are really not able to define the proper relations between things, and that is one of the reasons why a man, after he graduates, should not start immediately on consulting work, or to take entire charge of any enterprise.

It should be remembered that your course in the school is simply one of preparation; in other words, if you want to learn the mining business you have got to go into the mines and study it, just as if you were going to learn the dry-goods business you would have to go to a dry-goods store; to learn banking you would begin as a messenger or clerk and work your way up. The only advantage of going to a school of mines is that you get a technical education; you have a certain ground-work, which helps you out, and you also have gained a very important thing in knowing how to study, and knowing how to put two and two together so as to make four, and not three or five.

When a man goes out I would advise him to get a position at some mine or metallurgical works; it is not always desirable that it should be a particularly large mine or works; often he gets a better knowledge of what is going on by working in a smaller mine. When you take your first position in a mine I would advise you to work underground. This gives you an opportunity of watching mining work—sinking, drifting, stoping, timbering, tramming,—and it particularly gives you your first idea of the proper relation of things.

About fifteen years ago I was running the East New York mine at Ishpeming, Mich., and Mr. T. F. Cole, who is now manager of all the iron mines of the United States Steel Corporation, was running the Queen group of mines at Negaunee, Mich. We used to compare cost sheets, and his cost of development amounted to 2.5 cents per ton and mine amounted to 25 cents per ton. The reason for this was that his ore-body was in area ten times as large as mine, and, although my shafts and crosscuts were of the same length as his, the decreased tonnage was against me. This simply shows how the cost of development has got to be watched in its reference to the size of the ore deposit.

Take for example the opening of an iron mine at Lake Superior; after first striking the ore, the proper thing to do is to sink a small one-compartment shaft, one big enough for a good size bucket and ladder. With a shaft of this size you can get down to the ore and you can yet out a good deal of ore. After you have gone down a hundred feet and have your drift, and have some idea of the size and shape of the orebody, you can, if you find the conditions warrant it, put in a larger shaft.

I have seen prospecting or development schemes wrecked by the man in charge spending a lot of money and time in sinking what he called a "working shaft," and when he got down found that there was nothing to work, or at least it could have been worked through a small shaft. In prospecting or small mine work you don't want to put in any brick set or water-tube boilers, and you don't want too large an engine. You want to get a cheap portable locomotive or upright boiler. It won't hurt to burn a few extra cords of wood.

On the other hand, you also want to try to get the idea of how far you should go on equipment without going to the point of over-equipment. Suppose, for example, that you finally take hold of a mine that is developed and is producing ore for shipment, and you find the mine is fairly well equipped when you get there. You may find a great many things that do not satisfy you or do not come up to your ideas. You may find a shaft-house that was badly arranged; you may find that the hoisting engine is one that uses too much steam, and the compressor is not the right thing; that the shaft is crooked, and there is no skip only a bucket. Now, don't be in too much of a hurry to tear all of these out; go ahead and see what you can do with them, until you get to the point that you can definitely see and figure it out in dollars and cents, just how much you will save if you were to sink a new shaft or straighten out the old one; or if you were to build a new engine house or put in a new engine.

Some of the men who were at Copperhill, Tenn., last summer remember the excellent plant we had at the Burra Burra mine; there was a brick house containing water-tube boilers; there was a big power-house which contained a first-motion hoisting engine, together with a cross-compound, two-stage, air compressor, with room to put in another one. There was also a shaft crusher house with its paraphernalia. When I equipped that mine I had at the same time the idea of later putting in a similar equipment at the London mine, and I had the plans drawn and everything arranged for it. But, after carefully thinking the matter over and seeing the tonnage that came from the latter mine, I finally came to the conclusion that I would make a great mistake to take this mine, which was only 500 ft. long and 30 ft. wide, as compared with the Burra Burra, which was 1,600 ft. long and 80 ft. wide, and give it the same equipment, notwithstanding the fact that it would be very nice to have two or three mines all provided with exactly the same type of equipment. So, instead of putting in a duplicate of the plant we had at the Burra Burra, I simply bought a cheap geared hoist and put it back of the London shaft in a small building covered with corrugated iron, and we used the same boilers that had been used there since the beginning of the development work.

The more you work the more you will find out that there is absolutely nothing that cuts down cost as much as tonnage. Another suggestion is this: When you start up a new mine don't be in too much of a hurry to build a nice house for the manager or superintendent, or too grand an office building. That is one of the things that an English engineer at a new mine looks after before anything else. The first thing he does is to build himself a house, and then he goes ahead and develops the mine. If your mine happens to turn out all right it is very good to have lived well while developing it; but if it does not turn out all right, then the house that you built will be a monument to your folly. While I don't advise you to open up a mine and live in a hut or tent all winter, you must use proper judgment as to the kind of a house you do build.

Take, for example, the cost of underground haulage; you know that the tendency nowadays is to do underground haulage, wherever possible, with electric locomotives. It figures out as very economical, and the electrical people will be only too glad to estimate on the cost of installation and operation, but you must remember that it is the opinion of most mining men that for medium distances, say 500 or 600 ft., you can do nothing better than to use man power, for the reason that you have to give the man loading the cars a rest and he gets this rest, if the grades are properly made, by pushing his car out and waiting a minute or two at the shaft until it is dumped, and then pushing the car back again. This is a change from loading the ore, and so he trams really for nothing.

At one of the mines in Bingham Canyon, Utah, they mine about 1,000 tons per day, and it comes out from one adit, where it is handled by four horses—two on each shift. At one of the adjoining mines they put in an electric tramming plant, and yet the tonnage they have could readily be handled by two horses. It does not take much figuring to see that two horses are cheaper in first cost and up-keep than an electric installation. So, therefore, in adopting any particular apparatus, or any particular method, you must take into consideration the tonnage and conditions under which it is operated.

When you come to metallurgical work this factor will be strongly emphasized. Remember that you do not want to get things too automatic. I remember when I was talking with the late Richard P. Rothwell, of "The Engineering & Mining Journal," about Mr. Edison's iron-ore plant out in New Jersey; he said that the plant was too automatic, and that once in a while there should have been an Italian with a shovel. You will notice that at some concentrating mills they may have a certain product that has to be handled or moved to some other part of the plant for re-treatment. In a small mill that amount is so slight that one man could shovel it as it accumulates, so that under these circumstances it is no use putting in an elevator or some other apparatus to handle this small amount of material. In a large mill, however, it may be really necessary to have something to carry your concentrate and middling from various points where they are produced to a central point.

In metallurgical work, modern practice is along the line of labor-saving devices, but in a small blast-furnace plant, where you have but one furnace, it is a question whether it would pay you to put in a so-called automatic charging apparatus. This is the method in use at large plants, where the ore is run into cars and pulled by an electric locomotive to the furnaces. I believe that there is no doubt that one could get better metallurgical results in copper-blast furnaces by hand-charging than by dumping the charge from cars, but the cost would over-balance the metallurgical saving.

In places like Mexico, where wages are only 75 cents to one dollar per day, it is sometimes impossible to get enough men to do the work, which, of course, necessitates your putting in labor-saving devices, not to save money, but to run at all. When we started in Tennessee labor was a dollar per day, and we seriously considered whether it would be advisable to put in a charging apparatus for the furnaces. But I felt that in the South it would be difficult at times to get labor, and so, fortunately, I put in electric charging cars, and they have been a great success. This question of shortage of labor is important in an agricultural country. Take for example in Mexico: In the springtime the men go off to plant their corn, and when it comes autumn they go off to harvest it. You notice the same thing in Tennessee. In the spring the men go to plant their crops, and when the time comes to harvest, off they go; they do this regardless of whether it would pay them better to attend to their farms or not. For instance, in Central Mexico, where laborers receive two or three dollars a day, a man will leave his position and go to harvest a $30 crop and lose $60 in wages.

A man can frequently be penny wise and pound foolish in refusing to advance the wages of good men. So do not always be looking at your payroll with the idea that the best way to economize is to cut down wages. The first thing that an untrained man does when he goes to a mine is to try to find some way to save money. He looks at the payroll and finds that it amounts to $10,000 per month and that the supplies are $5,000, and that the mine is running behind. He concludes that the only way to remedy the matter is to cut wages. He does this; his men loaf, or the best leave him, and he runs still worse behind.

You want to be careful to see what work per man per day you get, so therefore it is essential to remember when you are engaging labor to pay about the same wages that are being paid by others in the district, and be slow about reducing wages, but see that the men work. Try rather to keep your wages a little bit higher than anybody else, so that you can get the best men; let the other fellows keep the poor men. If you get a good man and pay him 25 cents more per day, he will probably do a great deal more work.

Perhaps the young men who were down in Tennessee remember the two big trammers we had at the Burra Burra mine. One of the men has been with us at least four years. He is a stout, husky fellow, and would load just as many cars as two ordinary men would do. The ordinary man would load ore at 18 cents per car and perhaps get out 20 cars per day, while this one man would get out 16 or 18 cars himself. Now, then, think of the money we would save if all our men were of that kind. It would mean that, if we wished to, we could practically double the output of our mines.

Another thing you want to bear in mind is this: Never be afraid to engage a man who knows more than you do; that is just the kind of a man you are looking for and just the one you want. A young man, as a rule, never wants to engage a man, or have any man under him, who knows more than he does. If you engage a foreman, get one that knows all about the handling of men. If you get an engineer, get an engineer that knows something that you do not know, one who has had lots of experience at other mines; his experience will be of great benefit to you in solving new problems that will arise.

While I have referred more to the economical details of operating, there is another perspective view which takes a long time to get, and that is a comparative idea as to value of mines—whether there is really a mine or not—or whether it is going to be a small mine or a large mine; and the only way you get that is by looking at as many different mines as you possibly can. Never lose a chance when you are traveling or looking for a job to go into a mine and through its workings. If you visit a mine of any importance, try to get a position in the underground workings, because that is one of the things they cannot teach a man and which can only be acquired by long experience and by looking at different properties.

I might say that your college experience has enabled you to make a quick decision. Really the main thing in mining is the capacity to see a property in a par-

tially developed stage and from that inspection be able to determine whether it is going to be a mine. You find that it has 50,000 or 60,000 tons of ore in sight, and that it seems to have the earmarks of a large deposit, and you will advise your people to take it. If you have the courage of your convictions, if you think that it is good, stick to it and do not let the property go by. It is a great deal better for a man to make a mistake once in a while in getting hold of a property that does not turn out well than it is to let a good one go by. Still, however, if a young man makes two or three of these mistakes, it is likely to go against him in the long run; so I say to you, that when you start out, keep away from making these examinations, or, at least, from consulting work. It is very nice for you to go in as assistant to some engineer and help him in sampling and making determinations as to the value of mines, but do not get yourself into a position where you are called upon to pass judgment upon mines, because you may get yourself into some bad predicament, which will take a long time to live down.

I do not want you to understand that I would recommend a man starting out to begin as an assistant for an examining engineer. It is pleasant work, but I think that if one starts out in it he is liable to get rather a bad habit. Remember that the really successful consulting engineer is that man who has the capacity to size up a mine and to determine its value, and who thoroughly understands the cost of operating it. The whole tendency to-day is toward the mining of low-grade orebodies, and the question of operating expense is one of vastly more importance than the question of sampling and assaying the ore. For example, take the large porphyry orebody in Bingham Canyon, Utah; a man who examined it stated that it averaged less than 2%, yet his samples checked those of the mine manager within 0.01 per cent.

I recently examined a concentrating property in Nevada and the ore ran slightly under 3%, my samples checked on one of the mines within 0.03% and on the other mine within 0.02% of the results of the management. So you see that sampling, to a certain extent, is mechanical. In a large concentrating proposition of this kind the main thing is, what is it going to cost to mine and treat the ore. The original report on this mine by the manager had been taken over to Paris by the senior member of a large banking house and the figures as to the grade of the ore and the cost of treatment submitted to several French engineers, who simply laughed at the thing, and said it was impossible to treat ore of that grade. My examination showed that the conditions were exactly right for a big property—one that could be handled and show a large profit. The trouble with the French engineers was that they had not kept up with the latest practice in concentrating or the latest methods in reverberatory smelting, and, while they were only two or three years behind, they might just as well have been twenty years behind the times. Therefore, I say to you that one of the most important things for a successful consulting engineer to have is a good knowledge of operating; the only way to get a true idea of operating is to work your way up from the bottom.

There is also one other important thing in mine examination and mine operation, and that you have to study and pay particular attention to, and that is the geology. If it is copper, you must keep yourself posted thoroughly on secondary enrichment; if you do not, you will have difficulty in getting along. It was about eight years ago that I examined the Highland Boy mine in Utah; the fourth and fifth levels were then opened up and showed an average of about 7.3% copper and considerable gold and silver, but I could see plainly that a good deal of that copper was in the form of chalcocite, which I knew was secondary. Another engineer, who came out about the same time, looked the property over, and, although he agreed with my sampling and assaying, he predicted that the sixth level would only go one per cent; he gave too great a weight to secondary enrichment; later developments showed that the lower levels went four per cent, and the result was that his people lost a fine property. This simply shows the necessity for keeping thoroughly up on the literature of ore deposits, because it is being added to day after day with great rapidity. Of course, this is not as absolutely essential to you as a knowledge of operating, because there are certain geologists who make a specialty of studying ore deposits. In case of necessity, you can get a man of this kind to help you out, and you perhaps may be able to make certain economic conclusions which he was not able to see. Some of the big mining companies keep an economic geologist at work all the time. In a small mining company that is impossible, and the geologic work devolves upon the mining engineer.

When you get a mining engineer you want to get a man that has been well schooled, one who understands geological conditions and is able to lay out future work. This has been done in the Butte mines in the last three or four years, and I believe there is not a single crosscut in the mines of the Amalgamated that is not laid out on paper in the office before a stroke of work is done underground. Of course, you get a much better training now in geology than I ever got, not because your professors are any better, but simply because the subject is more thoroughly understood than it was twenty years ago.

Therefore, I say to you to study economic geology just as much as possible, because the question of ore deposition is one of such vital importance that you must forever have it before you. Whenever you see an orebody, and it is a particularly rich one, you want to look at it carefully and study the conditions and try to determine whether these conditions exist a hundred or a thousand feet down, or whether they are only local conditions. This capacity to see is one of the things that you can only learn by going around and seeing, and remembering what you see.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The light-colored flint-like rock from Nashville, El Dorado Co., Cal., is felsite.

The porphyritic rock from Virginia City, Nev., is andesite-porphyry. It shows no indication of mineralization, in a mining sense.

The rocks from the Black Bear Mine, Trinity Co., Cal., are No. 1 greenstone, probably diorite much altered; No. 2, a metamorphic clay rock.

The green-stained rock from Lusk, Wyoming, is quartzite, a metamorphic sandstone. The green mineral is copper carbonate (malachite).

The rock from Soulsbyville, Cal., is pegmatite, a coarse-grained dike granite. The large white crystal in the specimen is albite, (lime-soda feldspar).

The rocks from Pichacho, Cal., are: No. 1 amphibolite-schist; No. 2 felsite containing much finely disseminated pyrite; No. 3, diorite; No. 4, rhyolite tuff; No. 5, hornblende-andesite; No. 6, augite-andesite.

Unless the manganese ore discovered by the Montana prospector in his tunnel near Marysville contains silver and gold, in payable amount, it is very doubtful if the ore is of present value. Solid manganese ore (the only valuable kind in any place), needs no concentration. Very often a manganese outcrop covers a gold and silver vein.

The rock from Paterson district, Nevada, is meta-diabase. A thin section of this rock shows typical uralite resulting from the alteration of augite crystals, the nucleal portions of which, in several instances, are perfectly preserved, exhibiting clearly the characteristic cleavage approximating 87°. The uralite also shows in part the hornblende cleavage, though considerable portions are fibrous. The black borders of magnetite about these altered augites and also surrounding the biotite, are typical. It is a most interesting rock. Veins may occur in rock of this description, but it is improbable that the particular piece sent for identification came from the immediate vicinity of a vein, or ore deposit.

The rocks from Goldfield, Nev., marked R. H. M. are as follows: No. 10, a crystalline-granular mass of hornblende and soda-lime feldspar, with little quartz (Diorite); No. 11, Rhyolite tuff; No. 12, Diorite-aphanite; No. 13, Diabase; No. 14, a very silicious altered rock, probably originally Diorite; No. 15, Felsite; No. 16, Diorite; No. 17, crystallized quartz in a metamorphic clay rock, which would ordinarily be called slate. The quartz has crystallized from solution in a mass of brecciated slaty rock, and it seems probable that the larger fragments of the rock mass have been surrounded by granulated or pulverized material which was more readily dissolved, carried away and replaced by the quartz, atom by atom, than the large pieces of rock. It is inconceivable that the angular fragment of slate was suspended in space in an open crevice while the silica slowly deposited around it.

Personals.

J. H. Curle is in Japan.

Arthur Winslow has returned to Boston.

H. W. MacFarran is at Bingham Canyon, Utah.

Walter G. Perkins is now stationed at Ely, Nev.

John Hays Hammond has returned to New York.

R. H. Toll is examining mines in Boulder county, Colorado.

H. P. Garthwaite has returned from San Francisco to Salvador.

E. H. Jeffries has moved from Denver, Colo., to Yreka, Cal.

Leonard D. Sivyer is examining mines near Tonopah, Nevada.

Albert P. Low is now director of the Canadian Geological Survey.

R. G. Brown has his office now at 2031 Sutter St., San Francisco.

W. S. Noyes has an office now in Room 25, Albany Block, Oakland.

George S. Binckley, on his return from Mexico, is now at Berkeley.

D. M. Riordan of New York is at the Bully Hill mine, in Shasta county.

Arthur H. Halloran has returned to Berkeley from the Nevada gold fields.

Frederick Grundy has left Los Angeles to examine mines near Florence, Arizona.

S A. Worcester, of Victor, Colorado, is engaged in professional work at Telluride.

W. Spencer Hutchinson, of New York, is examining mines at Grants Pass, Oregon.

H. L. Charles was in San Francisco during the fire; he has returned to Butte, Mont.

Leonard Beckwith has been appointed mine inspector for the Mysore district in India.

J. D. Spargo is now superintendent of the Enterprise Mining Co., at Kingman, Arizona.

F. Lynwood Garrison, on his return from Santo Domingo, is on a visit to Joplin, Missouri.

H. W. Turner has returned to Portland, Oregon, from Kiam, Alaska. He is now at Berkeley.

Edward Westall, Supt. of the Marguerite mine, Sierra County, Cal., was in San Francisco lately.

L. P. Shackleford, of Juneau, Alaska, was on a visit to San Francisco during the catastrophe.

F. Wallace White will be at Haileyburg, Ontario, Can., for the coming three or four months.

Bruno Newman has been appointed engineer of the Santa Francisca mine at Asientos, Mexico.

H. H. Miller, has been appointed manager of the Mineral Development Co., at Guanajuato, Mexico.

U. S. Grant, of Northwestern University, will explore for iron ore in northern Minnesota this summer.

D. C. Jackling and R. C. Gemmell of Salt Lake City, have been visiting the iron mines in Minnesota.

A. C. Crider, late of the United States Geological Survey, has been elected State Geologist of Mississippi.

George E. Collins of Denver has been appointed general manager of the Newhouse tunnel at Idaho Springs.

Horace V. Winchell retains a connection with the Amalgamated Copper Co., becoming consulting geologist.

L. K. Armstrong is making an examination of the Q. S. Mine near Loomis, Wash., in company with A. M. Dewey.

E. W. Biedler, superintendent of the Palmer Mountain Tunnel and Power Co. was in California on his way to New York.

Frank H. Taylor of the Westinghouse Company has resigned as vice-president in order to take a prolonged rest in Europe.

J. J. Rutledge, consulting engineer of Baltimore, is making an examination of certain of the Illinois coal-fields for the State Geological Survey.

Samuel Calvin has been made State Geologist of Iowa again succeeding F. A. Wilder, resigned to undertake exploration for gypsum in Virginia.

Horace V. Winchell, chief geologist for the Amalgamated Copper Co. at Butte, has resigned. Mr. Winchell has received an appointment with the Great Northern Railway Co. and will reside at St. Paul.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

Sand used in concrete should be sharp, clean, and free from clay, lime, loam or organic matter, and should be thoroughly cleaned.

Porphyry accompanying a vein in any kind of rock is an indication of depth rather than size of ore deposit or richness of the ore.

It seldom pays in mines to drill holes deeper than 6 to 7 ft. even with machines, except possibly in large stopes, where deeper holes may occasionally be employed to advantage.

In some States legislation has been passed requiring district mining recorders to turn their records over to the county recorder. Such legislation is valid, and must be complied with.

Felsite is an intrusive dike rock, and not a volcanic or effusive rock. In the latter class the nearest approach to felsite is rhyolite, from which it is often difficult to distinguish it without the aid of the microscope.

Some of the gold mines of Georgia afford examples of the occurrence of coarse gold in slaty and schistose rocks without the appearance of any vein structure. The gold in one of these mines, the Boly-Fields, occurs with bornite, pyrite and dolomite.

There are doubtless numerous cement-making plants in Mexico, as cement has been employed in the building of the more important structures, such as bridges, aqueducts, etc., for nearly 400 years. 'Concentrates' is not informed as to the whereabouts of these works.

Bad running ground in mine drifts may sometimes be passed in safety, and securely held permanently, by the use of concrete. The forms must be quickly placed and the concrete made of liberal thickness in order to resist the crushing from the rock.

Portland cement is a product of a mixture of clay and calcium carbonate in definite proportions, calcined at a high temperature, and reduced to a fine powder. Natural cement is a similar product made in the same way from a natural argillaceous limestone. It also often contains carbonate of magnesia.

A fall of three inches per mile in a smooth, straight channel will give a velocity of about three miles per hour. The river Ganges, in India, has a fall of 800 ft. in a distance of 180 miles from its mouth. In flowing this distance a floating object requires more than a month to descend this 800 feet.

Auriferous sulphide ores occur in almost every kind of rock that is recognized as a distinct species. Granite, diorite, diabase, andesite, slate, schist and limestone are all wall rocks of gold-bearing veins. Volcanic glass and extremely basic rocks, like basalt, are not known to be gold bearing.

The owner of a mine must give to the owner of an adjoining claim extra-lateral support, that is to say, he must carry on mining operations in such a manner as will prevent the caving of the adjacent ground into the excavation he makes, and in the event of ore caving into his workings from the adjoining claim he cannot appropriate this ore to his own use. He is also liable for damage done.

The atomic theory regards matter as composed of infinitely small particles, called atoms, which are united to form molecules. The matter which comes within the conception of our senses is produced by the aggregation of an innumerable number of these molecules. These atoms and molecules are supposed to be in a state of perpetual motion, though always occupying a definite position with relation to each other.

Silver cyanide is soluble in an excess of potassium cyanide, with the formation of a double cyanide of silver and potassium, but at a certain point in the mixture of silver nitrate and potassium cyanide, the silver cyanide becomes insoluble and falls as a grayish flocculent precipitate. The quantity of silver nitrate necessary to be added before this precipitation occurs is recorded on a burette, and from the reading is determined the strength of a given cyanide solution.

The cost of concrete work varies greatly, depending upon the character of the work and proportions of cement employed. In break-waters, and in certain river and harbor improvements, it ranges from $4 to $10 per cubic yard; in sidewalks, curbs and gutters from $10 to $18 per cubic yard. In first-class foundations for machinery, the cost per cubic yard is about the same as for sidewalks.

The failure of a party to comply with a mining rule or regulation can not work a forfeiture, unless the rule itself so provides. There may be rules and regulations which do not provide that a failure to comply with such provisions shall work a forfeiture. If so, a failure will not work a forfeiture. (Bell vs. Bed Rock H. & M. Co., 36 Cal. 214.) This is the rule adopted by the courts of California and Arizona, but the contrary rule is applied in Nevada and Montana.

Where conditions are suitable, a good reservoir can be built by simply covering the inner surface of an excavation in sand and gravel with cement mortar. In one instance a reservoir was so formed, by coating to the depth of 1½ in. with cement mortar the sloping sides of an excavation in sand and gravel when the surface was damp. The mortar employed consisted of one part cement to five parts sand. This basin has held water without leaking for years under a head of 16 feet.

The mining laws of California do not require that mining claims be recorded, and provide no penalty for failure to record. Consequently the claim located in September, 1905, which was properly staked, in accordance with the legal requirements, is still a valid location, and the attempt of another to re-locate in November, 1905, is unavailing, as he has no shadow of title to the claim. Some States require recording of locations, and failure to place the location on record invalidates the location.

Agitation of finely pulverized auriferous sulphides in cyanide solutions, has resulted in satisfactory extraction at many places, and where power is inexpensive this method is probably to be preferred to any other. As high as 96% extraction was obtained by Dr. Scheidel on slime from the canvas plant of the Utica mine at Angels, Cal., but the extraction fell to below 70% on the ordinary concentrate from the vanners. This seems to indicate that fine grinding is what is required for high extraction from sulphides.

The final blowing out of a large copper furnace presents no peculiar features. The blast should be reduced as the charge sinks, and as soon as the slag stops running, the breast-wall, and if extensive repairs are imminent, some of the rear and end panels should be knocked in, and all stock and fuel dragged out, until a tolerably even bottom is reached, which needs no preparation for the succeeding campaign. A blast furnace may sometimes be blown out satisfactorily by charging only coke and limestone. It is said to leave the furnace clean and do no damage to the walls.

In a few mills, feeding by hand is still practiced, but it is doubtful if the most painstaking hand-feeding is as satisfactory as the work of the best automatic feeders. Those who favor hand-feeding contend that the five stamps in a battery are not equally efficient, and that hand-feeding will equalize this difference in crushing capacity; while this is true, to some extent, hand-feeding is not always intelligently performed. A man who has brains enough to discriminate between the performance of the individual stamps of a battery is usually worth more in some other position than that of ore-feeder.

In the early history of the Combination mine at Goldfield, Nevada, the high-grade ore, running between $150 and $250 per ton, was shipped. As the value of the ore increased the transportation and reduction charges also increased. The company milled ore running very much below $150 per ton. In one portion of the mine a small shoot of ore was found which contained over $1000 per ton. To avoid paying excessive transportation and smelting charges it was decided to mill this high-grade ore. Over $750 per ton was obtained in the batteries and on the outside plates, and the tailing was carefully impounded, dried and shipped. This tailing (not concentrate) containing less than $300 per ton, came below the special high rate, and as the smelters paid 95% of the value, the company realized an unusually high percentage of the precious metal content of their ore, at a minimum cost.

Production of spelter in Kansas was very close to full capacity. Illinois will show a decided increase in output in 1906 and 1907. Reports from producers of spelter show that stocks declined from 6,089 net tons on January 1, 1905, to 4,486 tons on January 1, 1906, a decrease of 1,360 tons. Since the imports of spelter in 1905 were 521 tons, as compared with 341 tons in 1904, and since the exports of domestic spelter and the re-exports of foreign spelter were 5,535 tons in 1905, as compared with 10,149 tons in 1904, the estimated home consumption figures out 199,125 tons in 1905, as compared with 180,911 tons in 1904 and 154,381 tons in 1903. As in iron and steel and in other metals, the consumption of spelter in 1905 broke all records and was very close to 200,000 net tons.

It is not an uncommon thing to find bright gold in the tailing from gold mills, that will not amalgamate. This gold may not be particularly fine, but is covered with a film of some substance which prevents contact of the quicksilver with the gold. The film may be very thin, so much so as to be transparent, but it is sufficient to prevent amalgamation. This film may usually be removed by attrition, such as would result from grinding in a pan or arastra. It is a well-known fact that the simple Mexican arastra is one of the best amalgamating devices in use, and it is no doubt due to the fact that the arastra brightens the gold particles and thus prepares them for amalgamation, in a far better manner than is possible with stamps or other pulverizing devices which lack the abrasive action of the arastra or the grinding pan.

Purple of Cassius was discovered in 1683 by Cassius of Leyden. It contains gold and tin oxide, and is employed in coloring glass with various shades of violet, crimson and purple. There are several methods of preparing this substance, one of the best known being the following: Half a gram of gold is dissolved in aqua regia, composed of 16.8 grams hydrochloric acid, and 10.2 grams nitric acid, and the solution is then diluted in 14 liters of water. To this solution is added, drop by drop, a solution of a mixture of proto-chloride and ter-chloride of tin is dropped, little at a time, into 18 finely divided tin is dropped, little at a time, into 18 grams aqua regia, made as directed above but with the addition of 5 c.c. water. The reaction is checked by cooling if it is too violent, and the solution of tin chloride formed is allowed to cool. The precipitate of purple oxide thus obtained is beautifully colored when it has been washed with boiling water.

There is a certain amount of galvanic action in amalgamating plates, both inside the battery and on the apron and sluice-plates. Some millmen attempt to increase the effect of this galvanic current by connecting the plates with electric wires. Too little attention has been given this subject to make it possible to state whether these attempts have resulted satisfactorily or not. The introduction of lead into amalgam causes it to become pasty, and results in loss of gold. The galvanic action of iron on the copper plates is greatly increased if the ore be first subjected to roasting. In those mills where electricity is employed, as an aid to amalgamation, the plates are connected with the negative pole, while the positive pole is formed by a plate of lead or iron dipping into the pulp. As a result, the mercury has a tendency to keep clean and bright, but the collection of base metals in the amalgam is promoted by the electric current, and a lower grade bullion is the consequence. This method should not be employed where the ore contains much lead, copper or zinc.

The Julian Process was invented at Johannesburg, South Africa. After chlorination of the ore in a barrel, mercury is added to the charge and the barrel again revolved. The result of this is to amalgamate the coarse gold in the ore, and to reduce the gold chloride. Chloride of mercury and metallic gold are formed, the latter amalgamating with the excess of mercury. The charge is then emptied out and passed over a set of amalgamated copper plates, on which the gold amalgam is partly retained. The tailing is then passed through a series of electrolytic cells each of which is provided with a bath of mercury at the bottom, while an electric current is passed through the water. In these cells, the compounds of gold and silver, soluble in the water, and all floured mercury and amalgam are supposed to be collected. The process has not come into extensive use, although it embodies some ingenious ideas, in taking advantage of certain well-known chemical reactions. The process is considered too complicated for general use, though it may be applied with success on certain unusual ores.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

BLAST FURNACE VS. REVERBERATORY.

THE EDITOR:

Sir—Mr. Neill's questions in reference to the comparative advantages of the blast furnace as compared with the reverberatory have reference, as I understand it, to the treatment of copper-bearing ores carrying more or less gold and silver. The questions and replies I give as follows:

1. On what should the choice of furnace type be principally based? Character of the ore, fuel, fluxes, building materials?

In the southwestern United States, as in New Mexico and Arizona, where oxidized ores of copper abound, these have been smelted directly to black copper in the blast furnace, producing a slag containing 1.5 to 2% Cu; but of late years, where sulphide ores have been available, matte smelting has been preferred, since the slag produced, carrying as little as 0.3 to 0.7% Cu, occasions less loss of copper. In smelting to black copper, some experiments made by Mr. J. D. Cooper of the Calumet and Hecla smelter, while in Arizona some years ago, have shown, that by the use of hard coal, it has been possible in the case of black-copper smelting, to bring down the percentage from the 2% mentioned above, to less than 1% in actual practice. However, these superficial ores are decreasing in quantity, and the smelting of them with sulphides is the prevailing practice.

We may say, therefore, that the ores which we have in view are sulphide ores carrying copper, and, in the case of pyrite smelting, such ores, carrying but little copper, but containing the precious metals, are those chiefly sought. These ores, as they come to the smelting works, are more or less finely comminuted, and, in treatment, their mechanical condition must be considered. Were the ore directly charged to the blast furnace, the force of the blast would cause a serious loss in flue-dust; whereas, in the reverberatory, the hearth is comparatively quiet, and, after charging, any dust caused by the dropping of the charge, soon settles. The reverberatory furnace does not burn off the sulphur as the blast furnace does, and hence, the ore going there must first be roasted. In this operation there is also a loss of dust, though to a much less degree than in the blast furnace. In the older practice of copper smelting in the blast furnace, it was customary to roast much of the ore in lump form, since it was then not affected by the blast, and, through the removal of the sulphur, it lessened the amount of the matte made. The practice, as we can see in pyrite smelting, is to diminish the amount of the fuel as much as possible, and to burn off in the blast furnace a large portion of the sulphur that the ore contains.

Sulphide ores, carrying iron with silica enough either in them or in the accompanying ore, to flux them, that is, self-fluxing ores, are favorable both for reverberatory and for blast-furnace treatment. Where the ore, however, is high in silica, the reverberatory, though it will work with quite silicious slag, has its limitations, whereas, by the addition of the required amount of limestone, the blast furnace can be run satisfactorily. It may be asked, why cannot the same thing be done in the case of the reverberatory? To this, one can say, so it can, but the difficulty is that these fluxes eat into the sides of the furnace. In this connection the blast furnace has an advantage in that, with its water-jacketed sides, operation is continuous, while, in the reverberatory it is necessary to stop periodically to patch or fettle the furnace, and, at longer intervals, to close it down in order to make radical repairs.

The percentage of fuel needed for either operation needs to be seriously considered. In the case of the reverberatory this has been brought down from 33 to 21% in recent practice at Anaconda. These differences are not at all such as are found in blast-furnace work, where the coke in the smelting of oxidized ore may be as much as 15%; while in pyrite smelting, as low as 2 to 3%, or even no fuel at all, has been used.

As regards the character of building materials, Mr. Neill has probably in mind the character of brick needed for building a reverberatory furnace. We have been accustomed to the use of the clay fire-brick, but practice is coming around to the extensive use of silica brick for the sides and roof of the furnace, and, as I have seen, for the bottom, also. This brick steadily expands in heating, so that cross-slits have to be made to allow for longitudinal expansion amounting to three inches in ten feet. Such brick is very durable when used in a furnace producing a silicious slag of 35 to 40% SiO_2, and resists the highest heat.

2. What are the comparative costs per ton of daily capacity of each type of furnace? In the case of the reverberatory, this cost should include the expense of the necessary roasting plant.

Referring to Hofman's 'Notes on the Metallurgy of Copper in Montana,' we may make a comparision between the cost of smelting in a 56 by 180 in. blast furnace and a reverberatory furnace with 20 by 50 ft. hearth dimensions.

Blast Furnace. 400 Tons of Charge Daily.

Labor (3 shifts)	$ 70.17
Fuel, 44 tons @ $7.50	330.00
Power for blast	48.00
Limestone, 25%, or 100 tons @ $0.50	50.00
	$498.17
300 tons ore @	$1.66
Briquetting fine	.10
Prime cost per ton	$1.76

Reverberatory Furnace. 112.5 Tons Daily.

Labor	$ 42.00
Fuel, 37 tons @ $4	148.00
Limestone, 4.5 tons @ $0.50	2.25
	$192.25
108 tons ore @	$1.78
Roasting	.35
Prime cost per ton	$2.13

The above results are for labor and materials only, but they serve to illustrate relative advantages. Recent practice at the Washoe plant of the Anaconda Copper Mining Co. will decrease these figures on each side. Taking again the available data, one may make an estimate for fuel and labor sufficient to give an idea of comparative results as follows:

Blast Furnace. 1600 Tons of Charge Daily.

Labor (3 shifts)	$ 120.00
Fuel, 160 tons @ $7	1,120.00
Power for blast @ $0.12 per ton charge	192.00
Limestone, 400 tons @ $0.50	200.00
	$1632.00
1200 tons ore @	$1.36
Briquetting fine	.10
Prime cost per ton	$1.46

Reverberatory Furnace. 275 Tons of Charge Daily.

Labor (3 shifts)	$ 42.00
Fuel, 56 tons @ $4	224.00
Limestone, 11 tons @ $0.50	5.50
	$271.50
266 tons ore @	$1.02
Roasting	.35
Prime cost per ton	$1.37

In the above figures it has not been attempted to determine actual costs, but only to reckon the variable constituent prime cost, leaving out fixed charges. Thus, while these figures enable us to institute comparisons, they are far from expressing the actual total cost.

3. What is the comparative space requirement for an equal tonnage?

Allowing that the space for storage will be the same per ton, whether the ore goes to one or other type of furnace, we shall find that a larger area is needed for the roasters and reverberatory furnaces together than for the blast furnace building, briquetting plant and power-house. Figuring on this basis, I have found for buildings, 58 sq. ft. of area needed for reverberatory treatment against 8.5 square feet for the blast-furnace plant, or nearly in the proportion of 7 to 1. It so happens that in the present practice of the plant the ratio of production is as 6 to 1; this is a curious coincidence.

4. What is the comparative cost of mechanical equipment for equal tonnage?

The ore intended for the reverberatories, under the conditions just given, is in the most favorable condition for roasting; containing, as it does, enough sulphur so that no extraneous fuel is needed for that operation. For such an ore, and to reduce the cost as low as 35c per ton, a mechanical furnace is required. The cost of such a mechanical equipment may be considered as fully offsetting that of the power plant needed for operating the blast furnace and the briquetting plant.

5 What are the comparative costs of power, labor, fuel and repairs?

Repairs, in the case of reverberatories, are a large item of expense as Mr. E. P. Mathewson has shown in your issue of March 24. In small furnaces some fettling is done after nearly every charge, while, in the largest, it is executed every month or six weeks. Another serious drawback to reverberatory smelting is that the sand bottom may come up, occasioning a loss of charge, and compelling the shutting-down of the furnace to dig out the old material and to make repairs. At the best, a large reverberatory must be cooled down every month or six weeks, after drawing off the slag and matte, and repaired by banking up the sides with sand or coarsely ground quartz rock. This cools down the furnace and delays operations. At least every six or eight months, radical repairs have to be made, which involve cooling down the furnace entirely, so that the workman may get in to make repairs. The arch, bridge, and sides of the furnace, at least near the fire-box, must be rebuilt. The blast furnace, on the other hand, with its fore-hearth, when in successful operation, needs but little repair. Even when the furnace is down, it can be cooled and its hearth or crucible speedily repaired. A fore-hearth, in most cases, may be made to last indefinitely, the trouble being rather that of filling up than of corrosion.

6. What are the comparative amounts of capital tied up in furnaces of each type, and how does this affect the cost per ton of daily capacity or of output?

Mr. E. P. Mathewson in the article already referred to, has given the costs of plant under both methods of treatment, in which he includes the concentrating plant. Were this excluded, the cost of plant would vary according to output. That is, a blast furnace with its building and equipment, and producing 1600 tons daily, would cost no more to erect than a 275-ton reverberatory furnace with the eight McDougall roasters needed to supply it with ore. If we accept this comparison, the ratio of cost, and of interest on that cost, are nearly as six to one. I recall an estimate of such a cost based upon daily output as being $400 per ton for a blast-furnace plant. Against this we would have $2400 as the cost of an equivalent reverberatory plant. This figured at 7% interest to 350 days' operation of the former and on 300 days of the latter (because of shut-downs for repairs) would make an additional cost in one case of 8c and in the second of 56c per ton.

7. What are the limiting necessities in the way of fuels for each type?

We are tied down practically to the use of coke in blast-furnace work. If the coalfields producing coking coal are near-by, then the smaller quantity of the more expensive coke offsets the larger amount of coal needed in reverberatory practice. Again, with non-coking coal near-by, the cheaper fuel has the advantage. Where the coalfields are distant the question of freight comes in, so that the ratio of cost between the coal and coke is less and in such cases is to be preferred. This has been brought out when considering the relative costs of the various grades of coal, where it can be shown that where the freight cost is high, the better-grade coal is the cheaper, in spite of the lower figures at which the lower-grade coals are offered.

8. What are the comparative losses in slag, dust, or middle products?

In the new reverberatories of Anaconda the charges are dropped into the furnace near the fire-box end of the hearth, and are there for the most part melted down, consequently the rest of the furnace for a distance of 50 to 75 ft. is a settler or fore-hearth, where a thorough separation is effected between the slag and the matte. As a result, the slag is but a fractional percentage higher than that of the blast furnaces of the same plant, and where a 16-ft. fore-hearth is used.

While there is no middle product in the regular operation of a reverberatory, it must not be forgotten that the extensive hearth becomes soaked up with matte, thus locking up values which are only recovered when an old hearth is broken out and a new one put in. This becomes a more serious matter in proportion to the amount of precious metals in the ore undergoing treatment. Such values, even when recovered by

smelting, owing to loss in slag, owing to expense of getting out the bottom, and of treatment, make an additional cost of $3 to $5 per ton, at least.

The flue-dust made by the blast furnace, even where the coarse ore is treated and the fine briquetted, is, in copper practice, another source of loss, since that product must be briquetted and re-smelted, thus undergoing double treatment. Besides this, such fine makes trouble in the furnace, occasioning accretions, raw ore at the tuyeres, and other troubles. Indeed, were it not for the assistance arising from briquetting, the losses would be much greater than they now are. In older blast-furnace practice, a 5 or 10% loss of flue-dust was not uncommon.

9. What are the defining limits of each type in regard to slag composition?

One hears and knows of high-silica slags such as those made at Mansfield, in Germany, carrying as much as 65% SiO_2, and of instances where, as in pyrite smelting, a low-grade matte is produced of 55% SiO_2. While such slags are often clean, they are viscous and slow-running, so that, for large output, a 40% silica slag is preferred. For a correspondingly liquid slag for reverberatory practice this limit of 40% should not be exceeded. One reads of slags, so silicious that they contain pieces of undecomposed quartz from the charge which pieces never have been melted, but have had their valuable metal extracted. Such slags have to be skimmed by the rabble, and are in no way suited to the conditions calling for a freely-flowing slag, which issues from the furnace as at Anaconda at skimming time at the rate of 5 tons per minute.

10. How do these differences in slag figure out in regard to slag composition?

In silver-lead smelting in the Rocky Mountain States, silica is estimated as costing 10c per unit or 20 lb. per ton to smelt. Hence, where the slag can be raised an additional 10%, as from 35 up to 45% SiO_2, it is equivalent to $1 saved in smelting. But, if at this regular percentage, the tonnage of the blast furnace drops off, it may cause a loss equivalent to this gain.

11. What method of charging do you advocate for a copper furnace assuming the atmosphere to be oxidizing?

Automatic charging does very well, crude as it appears to be, for the blast furnace, and, if necessary, it could be supplemented by a little hand-feeding where the furnace seems to need it. The older way was satisfactory where the amount of charge was small (100 tons or so), but for the large furnaces such methods are inadequate and expensive; so mechanical charging has been substituted. This consists in dumping into the furnace, direct from charge-cars or from buggies, sometimes as much as five tons at a time. It is to be understood, however, that these charges are added so as to keep the surface of the charge in the furnace as even as possible.

12. Would you bind, in some manner, all the fine for use in the blast furnace? Incidentally, what are the difficulties of treating fine ore in the blast furnace?

I should bind or briquette the fine by all means, especially, where a suitable binder is to be had. At Anaconda they are fortunate in having a slime or fine tailing resembling clay, which carries 2 to 4% copper and some silver, and which makes an excellent binder. In the practice at that place the fine ore and this binder are pugged and put through an end-cut briquetting machine, having an output of 840 tons of the mixture daily. It is charged moist to the blast furnace, not being dried at all. The briquetting is done with a force of nine men, including the foreman, and, hence, the cost per ton may be put at a low figure. Where, as is often necessary, a lime binder is used, the cost would be greater and the toughness of the briquette less. The evil resulting from an undue proportion of fine, comes from the choking of the furnace, the formation of crusts or accretions where this fine material adheres to the side walls, and the working down of fine ore through the charge until it appears at the tuyeres in an unmelted condition, introducing raw ore into the melting-zone of the furnace.

L. S. AUSTIN,

Michigan College of Mines,
Houghton, April 24, 1906.

THE GEOLOGICAL AGE OF THE EARTH AS COMPARED TO THE LIFE OF THE SUN.

The Editor:

Sir—In the April number of the 'Review of Reviews' there is an article on the age of the earth, which calls for this criticism. It appeals to a recent discovery regarding the apparent transmutation of radium into some other element, with the accompanying liberation of heat, as an explanation of the source of the sun's energy, related to the geological history of the earth. The writer, along with all the others who have written on the subject, overlooks the very apparent fact that the energy of the sun cannot be expended except on matter. Where there is no matter with one of the properties of matter, such as solid, liquid, or gas, there can be no loss of energy. If it were possible to expend energy on nothing, then O x Energy=O, so that energy is destroyed, which is contrary to the law of conservation of energy.

It may be argued that outside the earth's atmosphere, and in fact pervading all space, there is a fourth condition of matter without mass, which is called the ether, which serves the purpose of a medium of transmission for the sun's energy, and also of heat and light between the stars. On the earth the sun's energy is rendered sensible in terms of mass and temperature, so that where there is no mass the temperature must be absolute zero. This condition does not exist on the earth or in its atmosphere, but the temperatures at great altitudes, at the equator or elsewhere, show that the temperature of untenanted space is approximately absolute zero. How could it be otherwise? Heat being the effect of inter-atomic vibration, and there being no atoms to vibrate, the heat must be zero. That brings us back to the question of the loss of heat energy by the sun. It has all along been assumed that the sun radiates, or let us say loses, heat and energy equally in all directions. This is an absolute impossibility unless there is matter with mass at lower temperatures than the sun's to intercept each ray, or in other words, a solid mass of stars covering the entire sky. Even if each ray were intercepted if infinitely prolonged, the chances are in favor of it striking a bright star or sun as hot or hotter than our sun from which it would receive as much heat as it gave, and therefore lose nothing. If, therefore, the loss of energy by the sun is limited to matter with mass at lower temperature than its own, that loss will be a small portion of one per cent of what it would be according to all past teaching, by which it lost energy equally in all directions regardless of whether there was matter there to receive it or not. If the loss of energy is reduced in this manner, the time it would last is correspondingly increased, and the physicists and astronomers need not worry over the age of the earth or appeal to radium to make up the shortage.

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HIRAM W. HIXON.

Victoria Mines, Ontario, April 20, 1906.

HANDLING MEN.

THE EDITOR:

Sir—Through the medium of his article on 'Handling Men Underground,' appearing in your issue of March 3, Mr. R. B. Nickerson has precipitated a discussion which should be prolific of good results. I have read his contribution with much interest. In it he describes what may be considered the two extreme types of mining boss, neither of whom, to my mind, can be expected to secure the most desirable results, as has also been pointed out by Mr. Edward W. Ralph, under 'Discussion' in the issue of April 14.

This is one of the most important problems for the mine manager. He must select a superintendent or foreman in whom he places full confidence, and if a mistake is made in filling this important position, it may mean commercial failure, where success might otherwise have resulted. In the first place, before a man is fully competent to undertake the duties of the office of foreman he must have had his share of practical experience, such as will enable him to judge correctly the performances of the men working under him. It is a mistake, in my opinion, to place a tyrant in charge of men. An overbearing manner will not prove a satisfactory substitute for experience. In a single day the workmen will form a correct estimate of the capacity and character of their 'boss,' and will act accordingly. Even the most crafty foreman is not omnipotent, and the men will take advantage of his absence at each opportunity. Upon his unexpected approach, the signal is passed along, and although he may occasionally catch the idler, the net result of sneaking, espionage and underhanded methods is a loss of efficiency; the working force is disorganized, and the appearance of earnest activity is spasmodic; it is only a 'bluff.'

The antithesis of the spying foreman is he who fraternizes with the men, ever ready with a jest, and with the extended hand of good-fellowship. The men may speak of him as "a good man to work for," but they will usually take an unfair advantage of his leniency, almost as quickly as they will of a driving foreman, though possibly in a different spirit. They recognize in the easy foreman a friend, inclined to overlook shortcomings, and they will not fail, as a rule, to take their labors less seriously and earnestly than honest purpose should suggest. The crew is 'harmonious,' but it is also controlled by a spirit of leisurely effort; the laggard sets the pace for all. Put this same crew, or any one of them, on contract work and the difference in results is truly astonishing. Give the men an opportunity to display their skill and the latent force which lies in them, show a substantial appreciation of their work, and the pathway to satisfactory results is smoothed.

The foreman who is most successful is he who has had practical experience, who is a good judge of men and their work; who treats the men with firmness, divested of harshness, so that the men will respond promptly. Miners not only expect, but demand, just treatment from their employers, and the foreman who is firm, but just, who treats his men with decency, while maintaining his dignity, is the one who will accomplish the greatest economic, as well as the best social results, provided he is also competent to form a proper estimate of the individual and collective capacity of his men.

The foreman never ready to listen to a suggestion from those under his direction, or even to seek advice from them, is, if not a failure, at least not at his best. He may safely do both without loss of dignity or control. It has been demonstrated, not only in mines, but in industrial enterprises of entirely different character, that where the men are encouraged to use their brains as well as their hands, better results are always accomplished.

W. H. STORMS.

Berkeley, April 20, 1906.

Cements.—The term 'puzzolan cements' is applied to finely ground mixtures of slaked lime with certain argillo-calcareous materials. These added materials may be either natural products like the puzzolan, trass and sanitorin of the European cement trade, or basic slag from the blast furnace. In America natural puzzolanic materials have never been used, though they are known to exist at various points in the West. Slag, however, has been extensively used in the manufacture of slag cement. Slag cement, properly so-called, is the product obtained by pulverizing, without calcination, a mixture of granulated blast-furnace slag and slaked lime. This product, though in reality a member of the class of puzzolan cement, is often marketed as a portland cement in spite of the fact that it differs from portland cement in method of manufacture, ultimate and rational composition and properties. —Edwin C. Eckel.

Copper in Virginia.—The most noted copper region of Virginia is in the southwestern portion of the State in a belt of crystalline rocks passing through Floyd, Carroll and Grayson counties. The region is part of the eroded Blue Ridge upland marked by well-rounded summits and deeply-trenched streams, and is referred to as the Floyd-Carroll-Grayson plateau. The region was actively prospected in the early fifties and the rich secondary copper ores found beneath the gossan were boxed and shipped to Baltimore. During 1854-5 there were eight producing mines on the gossan lead; the aggregate amount of ore shipped for the six months from January 1855 to July 1855 being 1,454,363 lb. The ore averaged about 25% copper and at that time the metal was worth 26c per pound.—W. H. Weed and T. L. Watson in Economic Geology, Vol. 1.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

BLAST FURNACE VS. REVERBERATORY.

THE EDITOR:

Sir—Mr. Neill's questions in reference to the comparative advantages of the blast furnace as compared with the reverberatory have reference, as I understand it, to the treatment of copper-bearing ores carrying more or less gold and silver. The questions and replies I give as follows:

1. On what should the choice of furnace type be principally based? Character of the ore, fuel, fluxes, building materials?

In the southwestern United States, as in New Mexico and Arizona, where oxidized ores of copper abound, these have been smelted directly to black copper in the blast furnace, producing a slag containing 1.5 to 2% Cu; but of late years, where sulphide ores have been available, matte smelting has been preferred, since the slag produced, carrying as little as 0.3 to 0.7% Cu, occasions less loss of copper. In smelting to black copper, some experiments made by Mr. J. D. Cooper of the Calumet and Hecla smelter, while in Arizona some years ago, have shown, that by the use of hard coal, it has been possible in the case of black-copper smelting, to bring down the percentage from the 2% mentioned above, to less than 1% in actual practice. However, these superficial ores are decreasing in quantity, and the smelting of them with sulphides is the prevailing practice.

We may say, therefore, that the ores which we have in view are sulphide ores carrying copper, and, in the case of pyrite smelting, such ores, carrying but little copper, but containing the precious metals, are those chiefly sought. These ores, as they come to the smelting works, are more or less finely comminuted, and, in treatment, their mechanical condition must be considered. Were the ore directly charged to the blast furnace, the force of the blast would cause a serious loss in flue-dust; whereas, in the reverberatory, the hearth is comparatively quiet, and, after charging, any dust caused by the dropping of the charge, soon settles. The reverberatory furnace does not burn off the sulphur as the blast furnace does, and hence, the ore going there must first be roasted. In this operation there is also a loss of dust, though to a much less degree than in the blast furnace. In the older practice of copper smelting in the blast furnace, it was customary to roast much of the ore in lump form, since it was then not affected by the blast, and, through the removal of the sulphur, it lessened the amount of the matte made. The practice, as we can see in pyrite smelting, is to diminish the amount of the fuel as much as possible, and to burn off in the blast furnace a large portion of the sulphur that the ore contains.

Sulphide ores, carrying iron with silica enough either in them or in the accompanying ore, to flux them, that is, self-fluxing ores, are favorable both for reverberatory and for blast-furnace treatment. Where the ore, however, is high in silica, the reverberatory, though it will work with quite silicious slag, has its limitations, whereas, by the addition of the required amount of limestone, the blast furnace can be run satisfactorily. It may be asked, why cannot the same thing be done in the case of the reverberatory? To this, one can say, so it can, but the difficulty is that these fluxes eat into the sides of the furnace. In this connection the blast furnace has an advantage in that, with its water-jacketed sides, operation is continuous, while, in the reverberatory it is necessary to stop periodically to patch or fettle the furnace, and, at longer intervals, to close it down in order to make radical repairs.

The percentage of fuel needed for either operation needs to be seriously considered. In the case of the reverberatory this has been brought down from 33 to 21% in recent practice at Anaconda. These differences are not at all such as are found in blast-furnace work, where the coke in the smelting of oxidized ore may be as much as 15%; while in pyrite smelting, as low as 2 to 3%, or even no fuel at all, has been used.

As regards the character of building materials, Mr. Neill has probably in mind the character of brick needed for building a reverberatory furnace. We have been accustomed to the use of the clay fire-brick, but practice is coming around to the extensive use of silica brick for the sides and roof of the furnace, and, as I have seen, for the bottom, also. This brick steadily expands in heating, so that cross-slits have to be made to allow for longitudinal expansion amounting to three inches in ten feet. Such brick is very durable when used in a furnace producing a silicious slag of 35 to 40% SiO_2, and resists the highest heat.

2. What are the comparative costs per ton of daily capacity of each type of furnace? In the case of the reverberatory, this cost should include the expense of the necessary roasting plant.

Referring to Hofman's 'Notes on the Metallurgy of Copper in Montana,' we may make a comparision between the cost of smelting in a 56 by 180 in. blast furnace and a reverberatory furnace with 20 by 50 ft. hearth dimensions.

Blast Furnace. 400 Tons of Charge Daily.

Labor (3 shifts)	$ 70.17
Fuel, 44 tons @ $7.50	330.00
Power for blast	48.00
Limestone, 25%, or 100 tons @ $0.50	50.00
	$498.17
300 tons ore @	$1.66
Briquetting fine	.10
Prime cost per ton	$1.76

Reverberatory Furnace. 112.5 Tons Daily.

Labor	$ 42.00
Fuel, 37 tons @ $4	148.00
Limestone, 4.5 tons @ $0.50	2.25
	$192.25
108 tons ore @	$1.78
Roasting	.35
Prime cost per ton	$2.13

The above results are for labor and materials only, but they serve to illustrate relative advantages. Recent practice at the Washoe plant of the Anaconda Copper Mining Co. will decrease these figures on each side. Taking again the available data, one may make an estimate for fuel and labor sufficient to give an idea of comparative results as follows:

Blast Furnace. 1600 Tons of Charge Daily.

Labor (3 shifts)	$ 120.00
Fuel, 160 tons @ $7	1,120.00
Power for blast @ $0.12 per ton charge	192.00
Limestone, 400 tons @ $0.50	200.00
	$1632.00
1200 tons ore @	$1.36
Briquetting fine	.10
Prime cost per ton	$1.46

Reverberatory Furnace. 275 Tons of Charge Daily.

Labor (3 shifts)	$ 42.00
Fuel, 56 tons @ $4	224.00
Limestone, 11 tons @ $0.50	5.50
	$271.50
266 tons ore @	$1.02
Roasting	.35
Prime cost per ton	$1.37

In the above figures it has not been attempted to determine actual costs, but only to reckon the variable constituent prime cost, leaving out fixed charges. Thus, while these figures enable us to institute comparisons, they are far from expressing the actual total cost.

3. What is the comparative space requirement for an equal tonnage?

Allowing that the space for storage will be the same per ton, whether the ore goes to one or other type of furnace, we shall find that a larger area is needed for the roasters and reverberatory furnaces together than for the blast furnace building, briquetting plant and power-house. Figuring on this basis, I have found for buildings, 58 sq. ft. of area needed for reverberatory treatment against 8.5 square feet for the blast-furnace plant, or nearly in the proportion of 7 to 1. It so happens that in the present practice of the plant the ratio of production is as 6 to 1; this is a curious coincidence.

4. What is the comparative cost of mechanical equipment for equal tonnage?

The ore intended for the reverberatories, under the conditions just given, is in the most favorable condition for roasting; containing, as it does, enough sulphur so that no extraneous fuel is needed for that operation. For such an ore, and to reduce the cost as low as 35c per ton, a mechanical furnace is required. The cost of such a mechanical equipment may be considered as fully offsetting that of the power plant needed for operating the blast furnace and the briquetting plant.

5 What are the comparative costs of power, labor, fuel and repairs?

Repairs, in the case of reverberatories, are a large item of expense as Mr. E. P. Mathewson has shown in your issue of March 24. In small furnaces some fettling is done after nearly every charge, while, in the largest, it is executed every month or six weeks. Another serious drawback to reverberatory smelting is that the sand bottom may come up, occasioning a loss of charge, and compelling the shutting-down of the furnace to dig out the old material and to make repairs. At the best, a large reverberatory must be cooled down every month or six weeks, after drawing off the slag and matte, and repaired by banking up the sides with sand or coarsely ground quartz rock. This cools down the furnace and delays operations. At least every six or eight months, radical repairs have to be made, which involve cooling down the furnace entirely, so that the workman may get in to make repairs. The arch, bridge, and sides of the furnace, at least near the fire-box, must be rebuilt. The blast furnace, on the other hand, with its fore-hearth, when in successful operation, needs but little repair. Even when the furnace is down, it can be cooled and its hearth or crucible speedily repaired. A fore-hearth, in most cases, may be made to last indefinitely, the trouble being rather that of filling up than of corrosion.

6. What are the comparative amounts of capital tied up in furnaces of each type, and how does this affect the cost per ton of daily capacity or of output?

Mr. E. P. Mathewson in the article already referred to, has given the costs of plant under both methods of treatment, in which he includes the concentrating plant. Were this excluded, the cost of plant would vary according to output. That is, a blast furnace with its building and equipment, and producing 1600 tons daily, would cost no more to erect than a 275-ton reverberatory furnace with the eight McDougall roasters needed to supply it with ore. If we accept this comparison, the ratio of cost, and of interest on that cost, are nearly as six to one. I recall an estimate of such a cost based upon daily output as being $400 per ton for a blast-furnace plant. Against this we would have $2400 as the cost of an equivalent reverberatory plant. This figured at 7% interest to 350 days' operation of the former and on 300 days of the latter (because of shut-downs for repairs) would make an additional cost in one case of 8c and in the second of 56c per ton.

7. What are the limiting necessities in the way of fuels for each type?

We are tied down practically to the use of coke in blast-furnace work. If the coalfields producing coking coal are near-by, then the smaller quantity of the more expensive coke offsets the larger amount of coal needed in reverberatory practice. Again, with non-coking coal near-by, the cheaper fuel has the advantage. Where the coalfields are distant the question of freight comes in, so that the ratio of cost between the coal and coke is less and in such cases is to be preferred. This has been brought out when considering the relative costs of the various grades of coal, where it can be shown that where the freight cost is high, the better-grade coal is the cheaper, in spite of the lower figures at which the lower-grade coals are offered.

8. What are the comparative losses in slag, dust, or middle products?

In the new reverberatories of Anaconda the charges are dropped into the furnace near the fire-box end of the hearth, and are there for the most part melted down, consequently the rest of the furnace for a distance of 50 to 75 ft. is a settler or fore-hearth, where a thorough separation is effected between the slag and the matte. As a result, the slag is but a fractional percentage higher than that of the blast furnaces of the same plant, and where a 16-ft. fore-hearth is used.

While there is no middle product in the regular operation of a reverberatory, it must not be forgotten that the extensive hearth becomes soaked up with matte, thus locking up values which are only recovered when an old hearth is broken out and a new one put in. This becomes a more serious matter in proportion to the amount of precious metals in the ore undergoing treatment. Such values, even when recovered by

smelting, owing to loss in slag, owing to expense of getting out the bottom, and of treatment, make an additional cost of $3 to $5 per ton, at least.

The flue-dust made by the blast furnace, even where the coarse ore is treated and the fine briquetted, is, in copper practice, another source of loss, since that product must be briquetted and re-smelted, thus undergoing double treatment. Besides this, such fine makes trouble in the furnace, occasioning accretions, raw ore at the tuyeres, and other troubles. Indeed, were it not for the assistance arising from briquetting, the losses would be much greater than they now are. In older blast-furnace practice, a 5 or 10% loss of flue-dust was not uncommon.

9. What are the defining limits of each type in regard to slag composition?

One hears and knows of high-silica slags such as those made at Mansfield, in Germany, carrying as much as 65 SiO_2, and of instances where, as in pyrite smelting, a low-grade matte is produced of 55% SiO_2. While such slags are often clean, they are viscous and slow-running, so that, for large output, a 40% silica slag is preferred. For a correspondingly liquid slag for reverberatory practice this limit of 40% should not be exceeded. One reads of slags, so silicious that they contain pieces of undecomposed quartz from the charge which pieces never have been melted, but have had their valuable metal extracted. Such slags have to be skimmed by the rabble, and are in no way suited to the conditions calling for a freely-flowing slag, which issues from the furnace as at Anaconda at skimming time at the rate of 5 tons per minute.

10. How do these differences in slag figure out in regard to slag composition?

In silver-lead smelting in the Rocky Mountain States, silica is estimated as costing 10c per unit or 20 lb. per ton to smelt. Hence, where the slag can be raised an additional 10%, as from 35 up to 45% SiO_2, it is equivalent to $1 saved in smelting. But, if at this regular percentage, the tonnage of the blast furnace drops off, it may cause a loss equivalent to this gain.

11. What method of charging do you advocate for a copper furnace assuming the atmosphere to be oxidizing?

Automatic charging does very well, crude as it appears to be, for the blast furnace, and, if necessary, it could be supplemented by a little hand-feeding where the furnace seems to need it. The older way was satisfactory where the amount of charge was small (100 tons or so), but for the large furnaces such methods are inadequate and expensive; so mechanical charging has been substituted. This consists in dumping into the furnace, direct from charge-cars or from buggies, sometimes as much as five tons at a time. It is to be understood, however, that these charges are added so as to keep the surface of the charge in the furnace as even as possible.

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The antithesis of the spying foreman is he who fraternizes with the men, ever ready with a jest, and with the extended hand of good-fellowship. The men may speak of him as "a good man to work for," but they will usually take an unfair advantage of his leniency, almost as quickly as they will of a driving foreman, though possibly in a different spirit. They recognize in the easy foreman a friend, inclined to overlook shortcomings, and they will not fail, as a rule, to take their labors less seriously and earnestly than honest purpose should suggest. The crew is 'harmonious,' but it is also controlled by a spirit of leisurely effort; the laggard sets the pace for all. Put this same crew, or any one of them, on contract work and the difference in results is truly astonishing. Give the men an opportunity to display their skill and the latent force which lies in them, show a substantial appreciation of their work, and the pathway to satisfactory results is smoothed.

The foreman who is most successful is he who has had practical experience, who is a good judge of men and their work; who treats the men with firmness, divested of harshness, so that the men will respond promptly. Miners not only expect, but demand, just treatment from their employers, and the foreman who is firm, but just, who treats his men with decency, while maintaining his dignity, is the one who will accomplish the greatest economic, as well as the best social results, provided he is also competent to form a proper estimate of the individual and collective capacity of his men.

The foreman never ready to listen to a suggestion from those under his direction, or even to seek advice from them, is, if not a failure, at least not at his best. He may safely do both without loss of dignity or control. It has been demonstrated, not only in mines, but in industrial enterprises of entirely different character, that where the men are encouraged to use their brains as well as their hands, better results are always accomplished.

W. H. STORMS.

Berkeley, April 20, 1906.

Cements.—The term 'puzzolan cements' is applied to finely ground mixtures of slaked lime with certain argillo-calcareous materials. These added materials may be either natural products like the puzzolan, trass and sanitorin of the European cement trade, or basic slag from the blast furnace. In America natural puzzolanic materials have never been used, though they are known to exist at various points in the West. Slag, however, has been extensively used in the manufacture of slag cement. Slag cement, properly so-called, is the product obtained by pulverizing, without calcination, a mixture of granulated blast-furnace slag and slaked lime. This product, though in reality a member of the class of puzzolan cement, is often marketed as a portland cement in spite of the fact that it differs from portland cement in method of manufacture, ultimate and rational composition and properties. —Edwin C. Eckel.

Copper in Virginia.—The most noted copper region of Virginia is in the southwestern portion of the State in a belt of crystalline rocks passing through Floyd, Carroll and Grayson counties. The region is part of the eroded Blue Ridge upland marked by well-rounded summits and deeply-trenched streams, and is referred to as the Floyd-Carroll-Grayson plateau. The region was actively prospected in the early fifties and the rich secondary copper ores found beneath the gossan were boxed and shipped to Baltimore. During 1854-5 there were eight producing mines on the gossan lead; the aggregate amount of ore shipped for the six months from January 1855 to July 1855 being 1,454,363 lb. The ore averaged about 25% copper and at that time the metal was worth 26c per pound.—W. H. Weed and T. L. Watson in Economic Geology, Vol. 1.

Special Correspondence.

LONDON, April 18.

According to a statement recently issued, the Orsk Goldfields, Ltd., has a nominal capital of £600,000 in £1 shares. Of these 500,000 shares, credited with 15s paid up on each share, have been issued to the Siberian Proprietary Mines, Ltd., the vendor, in payment for the lease and options referred to below. The whole of these 500,000 shares have now been paid up in full, thus providing £125,000 for working capital, including rent and general expenses of the company. The remaining 100,000 shares are being held in reserve, and provision will be made thereout for the final payment for the properties and for further plant. The chairman of the company is Sir J. West Ridgeway; there are two continental directors and Heyman Orkin is the managing director.

The Orsk goldfields are situate in the Russian steppes in the Province of Orenburg about 250 miles south of Tscheliabinsk, on the Siberian railway, and about 200 miles northeast of Actubin, on the Orenburg-Tashkend railway. The primary object of the Company's operations is the development and exploitation of a valuable network of veins, which are being already worked in a primitive manner, and a systematic prospecting of the property with a view to further discoveries. The area to which these operations will extend is, in the aggregate, upwards of 16,000 acres. Mining operations on a limited scale have been in progress within certain narrow limits for the past six years, about 40,000 tons of quartz having been treated (according to the books of the present owners) for a yield of about 50,000 oz. of bullion (25 dwt. per ton), valued at 67s. 6d. per oz., which is equal to £168,750 or 84s per ton of ore crushed. This does not include any recovery from tailing, over 35,000 tons of which have yet to be dealt with. The profits accruing during these operations are represented as having amounted to £80,000, the mills running only 300 working days in the year, being closed down on Sundays and holidays. The profits for 1905 alone are said to have been about £20,000. Out of their total profits the owners have spent £20,000 for mills, machinery, (including one excellent 120 h. p. engine), buildings, telephone installation, etc., all of which are in good order. The ore is extracted under a system of tribute. The tributers used to pay, until the end of last year, about £5 per day, but now they pay £3 per day, for the use of each Chilean mill; that is, they are charged about 6s. per ton of ore crushed, and they receive the bullion from the three middle plates only. They are bound to sell the bullion to the owners of the mill at a specified price. The bullion from the first and fifth plates remains the property of the owners of the property, as well as the gold which is in the tailing.

The six Chilean mills now in operation are unable to cope with the present production. The existing reduction plant is to be doubled, after which it is estimated the profits will be increased by about £50,000 per annum, bringing up the total to £320,000 per annum. Labor, both skilled and unskilled, is stated by Messrs. John Taylor and Sons, who have lately been employed by the Siberian Proprietary Mines Ltd., in making a report on the property and surrounding conditions, to be plentiful, good, and very cheap. According, also, to their report, living in the district is cheap, and can be made comfortable. The climate is healthy and the people are well disposed. The Novgorodov reef, averaging 4 ft. in width, has furnished by far the largest proportion of the gold as yet taken out, and has averaged over a period of five years, according to the books of the late owners, 84s per ton. The assay of the Sofonofski reef, averaging in width 1 ft. 4 in., gave an average of 21 dwt. or 85s. per ton (excluding one assay of 7 oz. 18 dwt. or £32 per ton) and the Miaski reef, with an average width of 3 ft., gave 16 dwt. or 65s per ton.

Amongst the prospectuses issued this month, one of the most important is that of The North Cerro Muriano Copper Mines Ltd., formed under the auspices of John Taylor & Sons. The capital is £250,000 of which £75,000 is working capital. The property consists of an area of about 387 acres situate about 10 miles from the city of Cordova, Spain, and adjacent to the Cerro Muriano mines. According to a report by Mr. Alexander Hill, six distinct lodes have been traced upon the surface of the property to be acquired and there is every probability that they will be found to be of similar value to that now being worked in the Cerro Muriano mines. The prospectus states that the prospective value of the lodes is enhanced by the existence of extensive ancient workings, as in the case of the Cerro Muriano lode, where payable ore has been already developed below the old workings.

The report of Charlotte Plains Consolidated Gold Mines Ltd., (Deep lead area, Victoria, Australia) for 1905 states that the work of putting in drifts from the jump-ups, for the purpose of draining the wash-dirt, has been going on steadily, and some rich prospects of gold have been struck. As mentioned in the cable of March 19, a large body of black sand has now been met with, assaying up to 30 oz. of gold per fathom. The returns so far taken from these drifts, which, it is pointed out, are only in the shallow ground as yet, and from which no rich return was expected, are 184 oz. of gold from 275 fathoms of wash-dirt. A piece of quartz richly studded with gold was obtained in the sluice of the Charlotte Plains, and the assistant Government Geologist is of opinion that the reef or leader from which it became detached must be close at hand. The indications therefore point to exceptionally rich pockets and to the wash-dirt so far opened out being all more or less gold-bearing.

A report is issued from another 'deep lead' property in Victoria. The secretary of Loddon Valley Goldfields Ltd. states that the erection of the new auxiliary jump, completed in November last, which enables pumping to be carried on notwithstanding stoppages for repairs, has had a marked effect in the reduction of the water, the reports from the mine showing that the average pressure, which at the end of October last indicated 558 lb. per sq. in. at the bottom of the bores, has now been reduced to 27¾ lb. In anticipation of the wash being entered at an early date, the new shaft necessary for handling it has been sunk closer to the lead and timbered to about 450 ft. It is now being carried down to 535 ft., to allow of the effective drainage of the lowest parts of the lead. In view of the satisfactory position as evidenced by the rapid reduction of the water-pressure, it was decided to create and issue 30,000 new shares of £1 each to provide additional funds. The shareholders are reminded that Mr. Waldemar Lindgren, of the U. S. Geological Survey, in his report, which was circulated amongst them, estimates the gold contents of the property at £1,700,000, and possibly considerably more, and anticipates that the wash can be treated expeditiously and inexpensively when once the water is under control.

The Golden Horseshoe Estates Co. Ltd. (Kalgoorlie) held their eighth annual meeting last week. The capital is £1.500,000 in £5 shares. The net profit for 1905 was £305,604. The total ore treated at the mine and shipped to smelters during the year amounted to 223,035 tons, producing 196,680 ounces of bullion, containing 106,152 oz. fine gold, the extraction, excluding gold from re-treatment of tailing, being 88.91 per cent. The total cost per ton, including development, together with an allowance of 15 per cent for depreciation on plant, etc., amounted to £1.12s.5d., as against £2.5s.9d. for 1904. The chairman, Sir John Purcell, called the special attention of the meeting to the matter of ore reserves. He explained for the benefit of those shareholders who are not conversant with mining technicalities that he excluded entirely from consideration the quantity of ore estimated to be within a certain area, but not ready for stoping, and dealt only with ore reserves actually in sight and blocked out on three sides. This when worked out makes 931,307 tons, containing 700,352 oz. fine gold, of the value of nearl three millions sterling. He thought that this, of itself, must be regarded as satisfactory and encouraging, seeing that the ore actually in sight and ready for stoping is sufficient to supply their 150 stamps at the rate of 20,000 tons per month for a period of four years to come. Referring to the grade of the ore the chairman mentioned that 139,977 tons now considered of no value are included in the ore reserves. This had been done in order to allow for the necessary inclusion of waste from walls and intrusions of mineralised country, and the proceeding is based upon the assumption that, in the course of stoping, eight inches of each wall will come away with the ore. On this basis of working, the actual grade of ore to be treated in the current year will approximate closely to the estimated grade of the blocked out reserves. The chairman said the manager reported that in 1904 the allowance in question was not fully taken into consideration. They were of opinion that the policy of working the stopes to their full width and breaking, together with the ore, some eight or more inches of the walls is a correct one. The last 50 stamps were erected in order that lower grade ore might be profitably treated. In 1904 the average grade per ton was 22 dwt. In 1905 the average grade was somethin_ over 15 dwt. Thus in 1905 a far lower grade of ore was treated, with good profit, than was dealt with in 1904. The extraction from the ore treated in 1905 was a little less than in 1904. This is accounted for by the fact that in 1905 only 8,139 tons of ore were sent to the smelter, as against 18,059 so dealt with in 1904. On the subject of working costs, the chairman was glad to say that during the year 1905 they had succeeded in effecting a considerable reduction. The total working cost per ton of 2,240 lb., excluding development, was £1.8. 7 for 1905, as against £1.19 0 for 1904, or a drop of 10s5d. per ton. This year, by means of the improvement in the plant, the tonnage would be brought up to 20,000 tons per month, and the extraction maintained. Referring to recent "calumnious statements, unfounded insinuations and covert suggestions" affecting the mine, the chairman said: "We are told, forsooth, that the bottom is out of the mine—that we have but two years of ore reserves—and the like. Well, with the knowledge we have of our general manager over a period of years, we fully and confidently credit him when he assures us that, working them out on a most conservative basis, our ore reserves, developed and actually in sight, are sufficient to maintain the present output for four years."

The following from last night's 'Globe' is worth quoting: Writing from Johannesburg to a Liverpool friend, under date March 16, Mr. Rudyard Kipling gives in characteristic fashion his impressions of "Chinese slavery." Heading the letter, "This from the tortured Transvaal—Winston holding the tongs afar off," he writes: "It's a poor situation that the Book can't find a text for, and the Minor Prophets are full of 'em. When in doubt consult the Apocrypha. Things are bewilderingly bad here. A whole colony standing up to be shot at by their own people is an awful sight. I've been seeking the Chinese slaves in their loathsome dungeons. It looks rather better grub than in barracks, and I couldn't see any bars and padlocks. One downtrodden serf came in with the materials for a spread for some friends—wheaten bread at sixpence a loaf, corned beef and vinegar. He spent 2s6d. There's no restriction on good workmen going about as they please, and—well, the whole agitation at home makes me sick when I think of English cottages, sanitation, and food. If only the fools would come out and see for their crazy selves. But they won't."

MELBOURNE, March 3.

The new year has begun with mining in a decidedly flourishing condition at Bendigo and with depression at Ballarat. Bendigo is indeed a marvellous district. Geologically, of course, its saddle formations have invested it with a world-wide interest. To Victorians, however, the great question is the area in which these formations exist, and what is their vertical depth and how deep are these saddles gold-bearing. Today the New Chum has proved the presence of a gold-bearing saddle at 4,200 ft., and the Victoria Quartz, also on the New Chum line, has proved golden quartz to exist below 4,000 ft. The point of interest yet to be proved is the extent of these formations, and both companies are at work continuing their shafts to the depth of the center-country winze so as to open up levels and define the dimensions of the saddle as well as its quality. From 3,000 to 4,000 ft. is a depth that very few mines indeed have attained. Consequently it is hardly fair to take the results achieved below 3,000 ft. as a criterion of what the field is likely to do at that depth; still, there is the case of the New Chum Railway which at 3,000 ft. worked a saddle which gave shareholders profits amounting to £100,000. Mr. George Lansell is also breaking profitable ore in his No. 180 mine at 3,310 ft. Thus two out of the six or eight mines down below 3,000 ft. have got gold in payable quantities. Of equal, if not greater interest, is the possibility of the horizontal extension of the gold field. Up to the present time, Bendigo has won from within an area two miles wide and eight miles long, £82,000,000 worth of gold. In the middle of two miles are 13 anticlinal folds of the country. Really, however, the bulk of the mining work has been done on three main lines known as the New Chum, Garden Gully and the Hustler's. Not one of these lodes, however, has failed to produce gold at different times, but the superior richness exposed by the main lines has, as stated, led to their receiving the greatest attention. Mr. E. J. Dunn, the geological authority on the region, who out of pure love for his work has gone into harness again as director of the Victorian Geological Survey, is so profoundly impressed with the developments at depth, the extension of the field both north and south and the better prospects obtained on the side lines from the main anticlines, that he now deliberately applies the term 'illimitable' to the gold resources of Bendigo. It is not enthusiasm which makes him speak in that way. He does so with a full realization of the responsibility of his words and he says: "If the enterprise of

50 years is examined, it bears only the smallest relation to the possibility of the field as indicated by the actual work done. Knowing the gold that has been got, one is quite justified in predicting that there are centuries of work ahead of Bendigo. The great strength of Bendigo lies in the fact that its base is so well established that the industry will go on automatically. The companies have so many shafts and so many working faces being pushed ahead that although one mine may decline so many more will come in view that interest in the field will always be sustained. In Bendigo today it has become a matter of so many miners put on and so many ounces of gold won, that is, of course, providing the labor is employed with discretion." To this testimony can be added that of Mr. F. Greenard, mining inspector of Western Australia, who, after spending ten days on the field, has left it full of enthusiasm for its possibilities, for its winding plants, for the good ventilation, for the capacity of its mining men and for the intense loyalty of its people to the district. This last is the most gratifying feature to Victorians. We do not want outsiders to go to Bendigo because, as a rule, they come and spend money, lose it and then blame the field. The Great Southern is an example of this. When the claims were abandoned by John Bull after splendid sinking and but little driving on the saddles, it was taken up by the local company, which now appears to be on the high way to success. In conclusion, it may be said that the February returns of the field are the highest for many years, thus giving weight to Mr. Dunn's panegyric.

Turning from local to inter-state matters, the great event of the week has been the flotation of the Hampden-Cloncurry copper mines in north Queensland. The property is away in the extreme north of Australia, some 200 miles south of the Gulf of Carpentaria and was taken up originally by some of the old Broken Hill people, notably, Messrs. Knox, Schlapp, William Orr, and J. Harvey Patterson. It was intended to float a company with a capital of a million strong to build a railway from Normanton via Cloncurry to the mine. Negotiations, however, were blocked by the labor party in the Queensland Parliament. That party at the time was determined to prevent the construction of any privately-owned railways in the State. Coats, the great English cotton manufacturing firm, were understood to be prepared to finance the venture. However, with the rejection of the railway scheme the project fell through. For six years the company has had to wait for capital. The collapse of the Chillagoe mines helped to keep the field back, but the development of the O. K. and the Mt. Holloy mines, together with the high price of copper, has re-directed attention to the resources of the locality. The flotation provides for the creation of a company of 200,000 shares of £1 each, of which 100,000 go to the holders in the present company, and are fully paid up. They, in their turn, pay an underwriting commission of 25,000 shares to Messrs. W. L. Baillien, Lionel Robinson, Bewick Moreing & Co., and their associates for underwriting an issue of 50,000 shares at £1 each to provide working capital. In addition, 50,000 shares go into reserve. The company is thus being floated under very strong financial support. It may be added that prior to the deal being carried through, the underwriters got the call of more than half the interest held by the holders on the original company in the 100,000 shares; but this fact has not come out. Reports on the property are to the effect that copper worth £1,000,000 sterling is 'in sight' down to the water-level. A part of the promoters' scheme is to build a tramway from the Government line to the mine, but this project is to form part of a second flotation.

TORONTO, April 28.

Though the snow in northern Ontario is still deep in the woods, it has disappeared sufficiently along the river banks and in exposed localities to allow of active prospecting work, and thousands of treasure-seekers are busy in the Cobalt and adjoining districts. The rush is largely to the north of the Cobalt area proper, where a wider field presents itself, as so much of the township of Coleman and the adjacent townships of Bucke and Lorraine have been staked out, that the opportunities of the prospector near the scene of present productive development have greatly decreased. Hence the movement of the genuine prospectors—as distinguished from those who expect to make money by stock speculation, gambling in real estate, or catering to the wants of the miners,—is largely to the region further north.

The rush in this direction has ben stimulated by reports of the finding of rich gold-bearing quartz in Playfair township, some 80 miles north of Cobalt. Charles Hurd, who had been one of the party engaged in the survey of the township, brought back to Haileybury samples of quartz assaying $17,000 per ton from a deposit in the center of the township. Veins of quartz are reported to occur frequently in the locality, and in the northwest of the township cobalt bloom has been discovered, from which there is reason to infer that the other metals of the cobalt rocks may also exist. Large numbers from Haileybury and New Liskeard, as well as new arrivals, are trying their fortunes in this untrodden field. The Temiskaming and Northern Ontario railway has been built to within about 30 miles of Playfair, and the "end of the steel" is becoming more and more the objective point of the prospector. With the building of the road further north, which will be continued until it effects a junction with the new Grand Trunk Pacific near Lake Abitibi, every station will become more or less of a mining center and point of distribution from which prospecting parties will strike off into the woods and obtain supplies, so that even if the productiveness of the mines in the immediate vicinity of Cobalt continues, that town will lose much of its importance as a distributing focus and "jumping-off place." At present, however, building is going forward with great energy—whole streets of hotels, boarding-houses and business places are being run up, and speculation in town lots has run wild. The latest development is a real estate proposition put forth by a big syndicate of Toronto and Winnipeg capitalists who have secured 640 acres of land about 2½ miles north of the town, and laid it out as the North Cobalt townsite, in the hope that the business interests of Cobalt may eventually be centered there. Of course the settlers and investors in the present town are highly indignant over this widely advertised project, claiming that North Cobalt has no right to its name.

According to all the principles of sanitary science, Cobalt ought long before this to have been devastated by typhoid or some contagious disease on account of the defective sanitary arrangements, but so far no such outbreak has taken place, and, in fact, a recent inspection by an official of the provincial Board of Health showed the health of the place to be exceptionally good. Stricter methods, however, are being enforced by the recently organized municipal body, and the drinking of unboiled water is prohibited until a supply of uncontaminated water can be secured.

At the Foster mine a rich vein has been struck, five inches wide, in which free silver largely predominates. At the Nova Scotia mine a vein has been found carrying 8,000 oz. per ton. Near Clear Lake, about a mile from the townsite, a prospector named Charron has discovered a rich vein about five inches wide. The University or Glendinning mine, the property of George Glendinning, W. J. Blair and H. L. Kerr, has been shipping ore since November last, the returns from the output amounting to about $100,000. The shaft has been sunk to about 80 ft., and there are two drifts on the 70-ft. level, one having been worked for 90 and the other for 50 ft. The vein averages 15 in. wide, and is worked overhand, the waste rock raising the level of the drift instead of having to be hauled to the surface and dumped. A Rochester syndicate has secured the McKinley and Darragh mine, which will probably be joint-stocked and placed on the market.

Many smelter projects have been brought forward, but the mine owners are now for the most part less interested in that question, since a company including some of the leading operators undertook to start a refinery at Hamilton which will account for the cobalt, arsenic and nickel contents of the ore, as well as the silver.

The Government mining bill is now before the Ontario legislature. The principal feature is the substitution of a uniform method for the obtaining of mining rights for the various and conflicting systems in vogue under the present law. It proposes that all prospectors must take out a license, paying $10 annually. On making an actual discovery of valuable minerals they must stake out the claim and record it in the record office of the mining division. Each claim is to be a square of 20 chains to a side. The claim is subject to inspection, and if found satisfactory the prospector is required to do 180 days' work, distributed over three years, unless he chooses to complete it in less time. He may then buy the land, paying $3 per acre in surveyed localities or $2.50 per acre in unsurveyed territory, and acquires thenceforth an indefeasible title. Some objection has been raised to the latter provision, many contending that working conditions should be permanently imposed to prevent the evil of land being held unworked for an indefinite period by speculators, but the measure appears likely to go through substantially as introduced. In cases where, owing to depth of soil or overlying rock, the mineral does not outcrop, and trenching, sinking a shaft or boring with the diamond-drill are necessary to make an actual discovery, a working permit may be issued, giving the holder exclusive possession for six months on condition of his working the property five days each week.

The bill is to be supplemented with another measure fixing the taxation of mining lands, and providing for the giving of bonuses by the Province to smelters. No royalties on output will be imposed, but mining lands will be taxed eight cents per acre in unorganized districts, and five cents per acre in municipalities. Out of the funds accruing from this tax and the fees, etc., imposed under the Mining Act, $60,000 per year will be set apart for five years for bonusing smelters according to output on the following scale: nickel, six cents; copper, one cent; arsenic, one-half cent; and cobalt, five cents per pound. The limit of the amount to be paid to the refiners each year is $25,000 for nickel, $15,000 for copper, and $10,000 each for cobalt and arsenic, and should the output call for an amount exceeding appropriation, a division pro rata will be made.

Prof. Miller, the Provincial geologist, starts for the Gillies timber limit, just south of the Cobalt area, next week, accompanied by several assistants, to make a thorough survey of the mineralized section of the limit and a contour map. This is understood to be a preliminary step to the contemplated working of the deposits as a government undertaking.

The Canadian Geological Survey is sending out a large number of field parties to make geological and mineralogical investigations during the season. A. E. Barlow and party will trace the extension of the silver-bearing formation of the Cobalt area eastward into Quebec Province. Some important researches will be prosecuted in the Yukon and British Columbia. In the Yukon Territory, R. G. McConnell and J. Keele will make an estimate of the gold remaining in the gravels of Bonanza and Hunker creeks, near Dawson, and Mr. Cairns will study the silver deposits of Windy Arm. In British Columbia, R. W. Brock, W. H. Boyd and G. A. Young will complete an exhaustive study of the Rossland camp, and conclude their investigations in the Lardeau district. C. Camsell will explore the mining area of the Similkameen district, and Mr. Leach will investigate the prospects of coal and other minerals in the Bulkley valley. E. D. Ingall will visit all the leading iron districts to obtain material for a bulletin on the iron resources of Canada.

Frank Cochrane, Minister of Lands and Mines, announced in the legislature of the 23d inst. that anthracite had been found in New Ontario, specimens of which had been submitted to him. He declined to enter into particulars or specify the locality, but it is believed that the specimens came from deposits on the Albany river, which forms the dividing line on the north between Ontario and Manitoba.

JOHANNESBURG, March 26.

No greater proof could be found for the assertion that the troubles of the Transvaal are principally political, than the annual reports of the mines. This is the harvest time of the year for mining reports. At almost every meeting reference is made to the uncertainty occasioned by the Liberals, and the feeling of dismay occasioned by such men as Winston Churchill in his speeches in the House of Commons. In the majority of cases, the year ending December 31, 1905, was a very successful one, but the chairmen of companies warn stockholders of the probable dangers of 1906.

The annual report of the Rand Mines, Ltd., is always anticipated as one of the events of the year in mining circles. Mr. L. Reyersbach, presiding at the annual meeting held in Johannesburg last week, gave a masterly review of operations for 1905. The profits for the year are £1,786,179. The average working costs, calculated over the whole of the tonnage milled was 23s. 3.133d. per ton. There were 1145 stamps at work during the year, crushing 2,023,239 tons, from which 850,503 oz. (valued at £3,572,133) were extracted. The yield per ton for the year was 35s., 3.732d. Compared with 1904, an average of 135 additional stamps were in operation, and the tonnage milled was increased by 311,491 tons. The value of the yield per ton shows a decrease of 1s., 2.885d., and working costs an increase of 1s., 4.627d. per ton, the total decrease in profit per ton being 2s., 7.512d. The decrease in the yield is due in most cases to ordinary fluctuations in the character of the reefs. The enhanced working costs are attributed to a considerable increase in the amount of development done; also to an increase in hand-stoping, 37.6 per cent having been broken by hand, as against 7 per cent for the previous year, and finally to the effect which Chinese labor has had on the working costs,

owing to the laborers being unaccustomed to mining work.

The report shows that tube-mills are "going strong." Seven are now running on the subsidiary companies of the Rand mines; sixteen are being erected or are under order. It is thought that a further 1s., 3d. per ton milled will be extracted by the use of tube-mills.

The chairman of the Rand Mines, Ltd., shows conclusively how fatal the scheme of "white unskilled labor" would be for the Rand. If these mines are to be worked at a profit, under present conditions, it is absolutely necessary to have an abundant supply of Chinese or Kaffir laborers. Mr. Reyersbach shows that it is not the wealthy man who will suffer most through the diminution of the labor supply by unfriendly legislation. He can afford to wait, or he can apply his wealth to investments in other parts of the world. It is the artisan, the clerk, the engineer who will suffer most; the man who has invested his hard-earned savings in the mines. Some people think that the huge wealth of the Rand Mines, Ltd., is owned by a few millionaires. The annual report shows that the assets of the Rand Mines, Ltd., are owned by no less than 2,919 registered shareholders, a great number of whom live on the continent of Europe.

At the annual meeting of the Witwatersrand Township, Estate and Finance Corporation, the chairman referred to the prevailing depression due to present political conditions, by stating that the "gaunt specter of starvation stalks the streets day and night." We can almost feel the chilling effect of his shadow on our people, and for each man who comes under the influence of his ominous presence, there is enrolled a bitter and determined opponent of the dictatorial and blighting policy of the present British government.

SALT LAKE CITY, April 29.

Work has begun in the rebuilding of the branch railway between the mines of Alta and Sandy. The old horse-tram running from Wasatch to Alta is to be replaced by a standard road. Steam or electricity will be used as motive power.

The Columbus Consolidated at Alta has recently made connection with the main fissure on the 300-ft. level. The ore is identical with that on the level above, and no time will be lost in determining the extent of the new find.

Orders for two battery engines, to be used in the equipment of the Utah Copper Co.'s mill at Garfield, have been placed with the Allis-Chalmers Co., Milwaukee. Two more of the same type will be installed as the work progresses. Upon its completion the plant will supply 6000 h. p., and the cost of construction will probably exceed $100,000. It is estimated that the structural steel used in the various parts of the plant will amount to 12,000 tons.

One of the most important of recent strikes is that made lately by the Ohio Copper Co. at Bingham. In the latest stope on the 500-ft. level there has been uncovered four feet of native copper ore. The metal occurs in thin sheets, some of them $\frac{1}{16}$ in. wide and a foot long.

Developments at the Bingham Central, at Bingham, continue to be of an encouraging nature. The recent strike in the Jackling tunnel has exposed a fine body of ore of the same nature as the usual copper ore of the camp. In the Whitley tunnel a good grade of argentiferous lead ore is now being extracted.

The last shipment from the Big Fourteen property, of Stateline, has aroused considerable interest. The car was divided into first and second-grade lots. The first grade carried 475.5 oz. silver and 5.9 oz. gold, netting about $400 per ton, while the second class went 124 oz. silver and 1.4 oz. gold, bringing it close to $100 per ton. Two sacks of selected ore showing assays of 4,137.7 oz. silver and 46.34 oz. gold, and having a market value of $3,600 per ton, were also in the lot. The mine is being worked by lessees.

The past week proved to be a record breaker for the Tintic district. With twenty-one mines contributing, a total of 232 carloads of ore was shipped during the week.

An official report states that the California and Comstock mines, at Park City, have consolidated and will henceforth be operated under one management. Work will be started at once to bring these mines again into the list of producers.

The management of the Ohio Copper Co., at Bingham, is developing the lead ore deposits in its Winnemuck mine, and in a crosscut on the 140-ft. level has encountered three feet of high-grade ore.

In the development of the Harrington and Hickory mine of the Majestic holdings in Beaver county, large bodies of ore have been encountered. The company has been making irregular shipments to Salt Lake smelters during the past few months, but it is expected that operations will be carried on upon a much larger scale this summer.

It is generally believed that F. Augustus Heinze has secured control of the Bingham Consolidated. The option that Mr. Heinze secured when he acquired control of a large block of stock expired Friday, and it is believed that this option was taken up. The investigation of Bingham by Mr. Heinze has aroused unusual interest, and the outcome of the big deal is eagerly awaited.

On Friday the management of the Utah Apex company, of Bingham, let the contract for the new tramway which will extend from the Andy tunnel to a spur of the Copper Belt railroad. The contract was awarded to the Trenton Iron Works. The tram, known as the Bleichert tramway, will cost in the neighborhood of $40,000, and will make a span of 2200 feet. With a capacity of 200 tons per day the output of the mine will be greatly increased and the expense reduced to the minimum.

The new concentrating plant of the Godiva mine at Eureka, which was recently completed, has proven a great success, and is now in regular commission. The new mill has a capacity of 150 tons per day.

The last shipment from the New York, at Park City, carried 20% lead, 125 oz. silver and $1.80 gold.

Upon the completion of the big plant at Garfield the Boston Consolidated, of Bingham, will double its present tonnage. In the main stope seventeen sets have been erected and are still in ore. The daily output could easily be increased to 400 tons, but at present the smelters can handle only 200, and in the meanwhile a great reserve is being stored up.

BUTTE, April 23.

Among the forty or more new mining companies organized within the past six months to explore and develop copper properties in Butte, about a dozen of them are active, with good prospects of developing new producing mines. The Butte-Milwaukee Copper Co. expects to begin mining on the Pollock within a month or six weeks. The Pollock is a developed property which has yielded a lot of good ore in the past, and the company has four other claims on the same vein. They are the Colonel Sellers, Bird, Box Car, Florence and Stonewall. For 4,000 ft. the company owns ground on the Pollock vein. All the claims are patented. In addition to the Butte properties the company owns seven claims in Argenta mining district. John F. Cowan, of Butte, is president of the Butte-Milwaukee.

The Butte Copper Mining Co. is another active company among the new ones. The water has been pumped from the workings of the Trifle and in a few days mining will be resumed. The two Anselmo mines and the two Emmett mines will be opened later. The mines of the company lie just west of the Gagnon of the Amalgamated company and the Silver King of the Coran company, and the veins of the two latter mines pass through the new company's ground. The company expects to be able to ship ore from the old workings of the mines within a few months.

The East Butte Co. has completed its main three-compartment shaft to a depth of 350 ft., and is now sinking from that point. The shaft will be sunk at the rate of about 100 ft. per month and when the 500-ft. point is reached a crosscut will be started north and south through the entire width of the company's ground, while at the same time sinking will continue. It is the intention to put the shaft down to 1,200 ft. The lessees in the other shafts of the company are hoisting 200 tons of ore daily, of which 50 tons is first class, and is shipped to the Washoe smelter, while the remainder is treated at the company's concentrator in Butte. The 25 per cent royalties paid by the lessees is sufficient to meet the expense of development and improvements being made and is increasing the treasury reserve at the same time. The net earnings for April will aggregate $40,000.

The Butte Hill Copper Mining Co. has acquired 11 claims in the northern part of the district on the North Star lode, comprising about 173 acres. A shaft has been sunk to a depth of 135 feet, and is going down at the rate of four ft. per day. There is a fine vein showing in the shaft, the ore assaying for a width of four feet 30 oz. silver and a fraction over one per cent copper per ton. James Higgins, for many years one of Marcus Daly's superintendents, is president of the company, and Maurice Eisenberg is vice-president. Mr. Eisenberg is also vice-president of the Butte Copper and Zinc Co.

The Butte & Bacorn property, which is sinking its main shaft on the Colleen Bawn, is also on the North Star lead.

The Raven Mining Co. has opened the north Snoozer vein, and have 'in sight' about 150,000 tons of ore. Development continues on both veins on the 1200 and 1500 ft. levels, in the course of which the company is taking out nearly 100 tons of ore daily.

The Columbus-Butte Mining Co. appears to be in financial straits and has appealed to the stockholders to put up 2 cents a share on their stock to keep up the work on its mine. The company has been running behind ever since it started work, but the directors have been advancing money and taking stock in order to keep up the work. They announce now, however, that they have reached their limit.

The Pennsylvania mine of the Boston & Montana Co. was shut down for several days the past week because of the inability of the company to get timbers.

The name of the Butte & London Copper Co. has been changed to the Butte & London Copper Development Co. The change was made at the request of the London members of the board of directors, so as to indicate that the company is an exploration concern and is not yet engaged in mining copper. A statement, filed with the county clerk at Butte, shows that the company has $407,101 in the treasury and $30,000 worth of machinery on hand, and is the owner of the Greendale placer claim, on which it is sinking, and which it values at $5,000,000. The shaft of the Greendale has reached a depth of 250 ft., and is in rock in which a vein capping has been cut.

The North East Butte Copper Mining Co. has been incorporated with a capitalization of $1,000,000, by Butte and Oklahoma men. The Calumet and Butte Development Co., under the laws of Arizona, has been incorporated by Michigan men from Calumet and Hancock. A. M. MacKenzie, of Hancock, is in charge of the operations of the company at Butte.

The Butte Commercial Copper Mining and Development Co., the Butte Central Copper and Smelting Co., and the North Butte Mountain Copper Co., are among the latest companies incorporated, mostly by Butte men.

The West Butte Mining Co. has taken over half a dozen claims under option, in addition to the purchase of the Columbia, on which the original capitalization was based. It now controls the Columbia, Excelsior, Saturn, Vanderbilt, Henrietta, Donegal, Mint, Montrose and Flagstaff. The claims are to be developed by sinking the main shaft on the Columbia, now 140 ft. deep, to a depth of 1,200 feet.

It is stated on good authority that F. Augustus Heinze, who has secured control of the Bingham mines in Utah, is associated with J. A. Coram in the American Consolidated Copper Co., and that the latter's plans have been completely changed. The intention now is, so it is stated, to take in not only the Davis properties in Butte, but also the Bingham property, the Montana Coal and Coke, the Smokehouse Co. and Coram's California company. The promoters of the new company say that within a reasonable time after its complete organization it will be able to produce 100,000,000 pounds of copper yearly. Mr. Coram and Mr. Heinze have been in Butte for several weeks. Mr. Heinze has also become interested again in British Columbia. He has taken an option on 40 claims, mostly copper, along the line of the Grand Trunk Pacific railroad, the amount involved being $5,000,000. He is also interested in a project to build a smelter in the new Cobalt district, to cost $750,000. A site, consisting of 670 acres, has been secured for the smelter near Haileybury.

In March the Butte Coalition Co. produced 2,750,000 pounds of copper. The Butte Copper Exploration Co. is making good progress in sinking on the Six O'Clock group. The work has averaged more than five feet per day, and it is expected to reach a depth of 1,000 ft. by September.

Tin From Straits Settlements.—Consul-General Wilber furnishes from Singapore the statistics of tin exports from the Straits Settlements to the United States as follows: The total shipments of tin from the Straits Settlements for 1905 amounted to 63,710 tons, 18,905 tons going direct to the United States, 35,294 tons to England, and 9,511 tons to continental Europe. A small falling off in exports to the United States was caused by the high rates of exchange and by the advance in freight rates during October, November, and December by the New York shipping conference. The shipments to England the past two years materially increased, while those to the Continent gained gradually during the past four years. Many indirect shipments for the United States go from Singapore to England and the Continent which if shipped direct would materially increase the declared exports of tin to America from this region and cause more return cargoes of merchandise.

MINING SUMMARY

CALIFORNIA.

INYO COUNTY.

(Special Correspondence.):—Patrick Clark, of Spokane, has ordered a complete hoisting plant, operated by gasoline, for the shaft on the Copper Blue claim of the Furnace Creek Copper Co., in Death Valley, California. James Porter reports that the shaft is down 100 ft. and that the bottom is all in 30% ore—malachite and copper glance. It has been decided to sink the shaft 500 ft. and to crosscut at the 250 ft. level. Dennis Clark, vice president of the company, says they expect to have a smelter next summer.

Spokane, April 14th.

SAN BERNARDINO COUNTY.

As illustrating the dangers to those strange to the desert region, Peter Wilson has been taken to Needles to be treated for dementia. While Wilson was unloading machinery at Vontrigger, the new mining camp between Goffs and Manvel in the eastern part of this county, he wandered away and for three days roamed over the sand dunes, in all that time having no water or food. When found he was partially clad, his shoes and stockings were gone and his feet were bleeding from several lacerations received on the jagged rocks. This is the third man who has wandered away in the sand dunes in this manner within the past two weeks, though the first two did not fare so badly as Wilson.

COLORADO.

SAN JUAN COUNTY.

The Silver Lake mill, three miles from Silverton, was totally destroyed by fire at 4 o'clock on the morning of the 20th inst. The loss is estimated at $250,000, fully insured. The fire was doubtless of incendiary origin, as when the watchman discovered the blaze, which started in the office of the mill, and called for assistance, the hose was found cut, making headway against the flames impossible. But for this the fire could have been easily subdued.

The Silver Lake is the property of the Guggenheim smelter trust and was formerly owned by E. G. Stoiber. The capacity of the mill was 300 tons per day. There were 150 men working there at the time of the fire. No other buildings were damaged. It is thought rebuilding will begin as soon as possible.

NEVADA.

CHURCHILL COUNTY.

Surface rock that carries a high percentage of copper, a fair percentage silver, and a trace of gold has been found in Bliss canyon in the Jackson range. The discovery was made by J. Winkler who has staked out claims in the vicinity. Assays of the rock brought into Winnemucca by Winkler show 27.8% copper, 7.2 oz. silver, and a trace of gold. He will begin development this spring. Jackson mountains are about 65 miles from Winnemucca and have long been regarded as an excellent mining field. The advent of the Western Pacific will hasten the development of that region which is rich in high and low-grade ore. The present survey of the Western Pacific passes within a few miles of Jackson mountains and will make the shipping of ore profitable, where at present it is almost out of the question except in the case of high-grade rock.

The company shaft of the Manhattan Nevada Gold Mines owning the Georgey group at Central, is down 77 ft. The shaft was sunk through the vein, which pitched at an angle of 60°, and the bottom of the shaft is not yet through the ore.

A stamp mill has been erected just off the Georgey ground, and the Milling company obtained permission to sink a well on the Manhattan Nevada Gold Mines Company's property. A site was selected in the lowest portion of the property, near the mill, and the well started. Before they had obtained a depth of ten feet, ore was struck, and at the water level, about 60 ft., good milling ore encountered. The mill people are now negotiating with the owners of the Georgey group to get a contract for the handling of the ore from the well. Enough high-grade ore taken from the Manhattan Nevada Gold Mines can be furnished to keep the mill running.

LINCOLN COUNTY.

(Special Correspondence).—President Ripley, of the Santa Fe railroad, says that the Searchlight-Barnwell railroad will be completed within three months.—A new engine and pump have been ordered for the Santa Fe mine, which has been handicapped with a large flow of water, and preparations will be made to handle 200,000 gallons per day.— The Searchlight Mining & Milling Co. has struck ore in the east drift of the 250 ft. level. This ore is impregnated with coarse gold.— The Cyrus Noble Extension is doing systematic trenching to locate the exact position of the ledges of the adjacent property before determining the best position to sink the main shaft. This company has secured two more fractional claims.— The Superintendent of the Big Six Mining Co. is to install hoisting and pumping machinery. This company has struck a large flow of water at the 240 ft. level, which greatly interferes with further operations until adequate machinery is installed. The Cyrus Noble is forging to the front as one of Searchlight's best producers. All work is being rushed to its fullest capacity, especially with the underground work where drifting to the north is progressing to determine the extent of this ledge. Regardless of the heavy expense this company has been put to by the many new improvements in building and machinery, a dividend will shortly be declared.—An accidental discovery has been made at the Pompeii mine. The barrels into which water has been pumped direct from the shaft were found to contain several inches of sediment that by assay was found to carry thousands of dollars per ton thus showing that this mine is no exception to the rule of the district, that rich ores lie below the water level. A new electric pump is to be installed at this mine with a daily capacity of 500,000 gallons.

The cyanide plant of the Duplex Company is completed. The 18,000 tons of tailing of this company it is estimated will be handled at a cost of 50c per ton.— In El Dorado district the new hoist of the Venus is now on the ground and development will continue.— Ore is now being taken out of the Mountain Group in many different places, and a great deal of it is being sacked and prepared for shipping. The Rand shaft is all in ore. The developments in general at El Dorado canyon are surpassing the expectations of the owners, and according to present indications this district should give an excellent account of itself.

Searchlight, April 8, 1906.

(Special Correspondence).—The effect of the recent disaster in San Francisco has been felt in the Searchlight district to a certain extent, yet the wheels of progress did not stop, nor will the loss be felt to any exceeding extent, as Searchlight had little or no securities on the San Francisco exchange. Contributions to the stricken city were sent immediately, amounting to $1,085.—Grant Bros., railroad contractors, who have the contract for building the railroad from Manvel to Searchlight, have agreed to complete the road in 90 days, and are rushing work.—Another company operating within the town limits is the Nevada-Searchlight. This new company has acquired the mineral rights under both the Grand Central and the Arizona townsites, which are adjacent to the main portion of Searchlight.—The Buster group of five claims is held by Dawson & McKenzie under a working bond. These claims lie in the Nob Hill district. Mr. Allen, who will remain in charge of development, states that it is the intention of the company to start on the main vein. Several hundred feet of depth can be secured with such a tunnel.—The Quartette mine has opened up the orebody on the 900-ft. level, demonstrating that this mine has ore at that depth. The Bay State shaft that this company is sinking west of the principal workings is being rushed, and as soon as water is secured in this shaft the 20 new stamps now on the ground will be added to the 20 now in operation.

El Dorado District:—Reports from the Venus show constant improvement as work progresses. Some of the ore runs into the thousands; the ore-shoot is large and contains an average of $30 per ton. With cheaper railroad facilities this district will make many shipments of excellent ore.

Searchlight, April 24.

NYE COUNTY.

(Special Correspondence):—With the connection now being made between this camp and the Clark R. R. where we are to have a Station (No. 73), prospectors and mine owners here are jubilant, as it is evident we will now have an outlet for our ore. Only the destruction by last month's storms in Meadow Valley, Wash., between Las Vegas and Caliente, has prevented our station's earlier completion. The citizens here are building a large road leveler which is to be dragged forth and back between here and the station 12 miles distant, by 12 mules, until we have a good road, clear of rocks, brush, and hummocks and making a straight line, broad and level, over which to run a line of automobiles.

Since my last letter several prospects have been sold. Mr. Lake sold five claims for $2,500. Wm. W. Smith sold a group for $2,500. Boller, West & Co. sold three locations, just opened up on an eight foot vein. These sales were for cash except the last mentioned, which went for $1,000 cash, balance in stock, so it is evident there is something of promise in this part of Nevada also. This district is certain to come to the front after a time but it has been, up to date, completely isolated. Thomas & Co. will put in a mill this summer. Swain & Co., Colorado people, are figuring on a custom mill and cyanide plant, having abundance of water. This company is preparing to do business, as they have some as fair prospects as any in the district.—Parties are coming in looking for business openings, a new hotel among other things, and a Salt Lake branch store.—It will be possibly two weeks from this date until we can announce the completion of the road to Station 73, by which time our auto road will be completed, and then Johnnie will come to the front as an ore producer. The veins of this camp are large and attract the attention of mining men who see them. With the improved conditions we expect to do business.

Johnnie, April 21.

J. A. Kirby, general manager of the Montana-Tonopah Mining Co., has made public the quarterly report of his company for the months of January, February and March of this year. During the quarter 3,061 ft. of development and exploration work was done. On the first level 100 ft. were crosscut, and high-grade ore was found. On the second level the miners drifted 269 ft. into the vein, and cut several shoots of shipping ore, which will be developed. On the third level crosscuts have been met with satisfactory results, according to the report. Drifting east and west from the crosscut on the fourth level, the company raised 30 ft. on the vein in ore. Some of the drifting has been on good ore. On the fifth, which is the lowest level, drifting has been done east and west on the veins. In the east drift the company expects to cut an orebody inside of 50 ft.

Shipping ore is being stopped on all levels, it is stated, and several shoots of first-class ore on different levels have been neglected because of the limited hoisting capacity. During the past three months 2,638 mine cars of shipping ore; 1,151 cars of mill ore, and 13,442 cars of waste were hoisted. A new steel gallows frame has been erected, and will be in use in a few days, and a new hoist is expected in the near future.

The Consolidated Manhattan Gold Mining Co. at East Manhattan has a vein which outcrops boldly. The superintendent states that the ledge is fully 150 ft. wide. Pannings have been made at different points on the outcrop with good results. The company is developing this property by a tunnel on the Blue Bird claim, and, it is the intention to continue this tunnel opening up all ledges which traverse this hill. The face of the tunnel is in ore of low grade.

WASHOE COUNTY.

Recently a party examining the old Harris mine, to get knowledge of a group of claims adjoining it, made a valuable discovery. The vein was uncovered a few days previously by a blast made by the foreman. Mr. Stevens and Mr. Seibert knew that they had uncovered a good ledge, which was but one of the incidents in the plan of development as laid out for the mine, and examination of the ledge itself was not made. While a tour was being made through the tunnel the new ledge was carefully examined. There, plainly in view, was seen free gold. It was a sudden revelation and reminded one of the times when Edward Harris, owner of the mine, used to pound out by hand and mortar, thousands of dollars from rock knocked off the ledges with hammer and pick, with never a dollar's worth of machinery on the ground. Every mine in the district is making unusual progress and one discovery succeeds another in striking frequency. Within the last month astonishing headway has been made in this camp. The Rocky Hill extension has uncovered three of the ledges of the famous Rocky Hill mine. The Galena Hill property made a strike of rich galena which set the district agog.

The Willow Creek people, Mr. Clapp, superintendent, have uncovered a four-foot ledge of solid argentiferous galena, and now comes the discovery of this phenomenal ledge in the Harris. Such is the story of Washoe. Much prospecting is being done and new locations are being made. Among the new moves in the camp is the incorporation of the Harris Extension property. The Harris extension Company has taken eight claims adjoining the Harris mine. The incorporators of the Harris Extension are holders in the Rocky Hill, the Rocky Hill Extension and the Harris mines.

Nulty and Cocking have transferred their holdings in

the vicinity of the Rocky Hill mine to J. M. Fulton and associates. The price is $30,000. The property is a group of claims traversed by several dykes and ledges. Little development work has been done, but sufficient to show that the property is valuable.

WHITE PINE COUNTY.

A two-foot ledge of solid argentiferous galena, assaying 70% lead, was discovered last week by Bud Gallaher, three miles north of McGill's ranch on Duck creek. The ledge outcrops on the surface for 500 ft. Sixteen claims have been located in the vicinity of the strike, and prospectors are giving the district a more thorough examination than it has ever received before. The new discovery is 17 miles northeast of Ely, and the Nevada Northern will pass within two miles of it.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence):—At the Mountain Boy, in driving on the old workings, 30 sacks of ore were taken out the week ending April 14, which sampled $1100 per ton.—In the Ben Hur on the 300 ft. level, drifts have been driven 150 ft. on the pay shoot, from the crosscut. Small streaks of ore were encountered in driving and stoping that were rich in gold, and silver sulphide. A part of the stope above the 300 ft. level has been opened up to within 20 ft. of the 230 ft. level, but this seems to have no connection with the two ore shoots above. A winze is being sunk on the pay shoot below the 300 ft. level.—In the Copper Key a drift is being driven southward from No. 2 tunnel to get under the pay shoot developed on the level above. The face is in quartz. The difference of elevation between No. 2 level and the lowest point ore was found above is 210 ft.—In the Protection Fraction, a seam of coal was discovered two years ago within the city limits of Republic. A bond has been given with the right to mine, and men are now employed opening the prospect. About three feet of coal is in sight.

(Special Correspondence).—Fourteen carloads of ore were shipped in April from the Pearl Consolidated mine, but the grade was low. On the bottom, level ground is being prepared for stoping 165 ft. north of the shaft. A sample from the back assayed $12.20, and a muck sample, from the ore after it was broken down, ran $12.45 per ton. A crosscut started from the south drift on this level has not reached the hanging wall. There is an immense quantity of low-grade ore in the Lone Pine workings, and also exposed on the vein which runs 3000 ft. through the Pearl and Surprise claims, but it will all remain valueless until a method can be found suitable for its treatment at a low figure. The latest from the Lone Pine crosscut is an assay of $13.30 per ton.

Republic, April 28.

OKANOGAN COUNTY.

(Special Correspondence).—Operations on a larger scale than heretofore are to begin on the Leadville group of thirteen claims on Palmer mountain. A. S. Hickey, who was sent out from Columbus, Ohio, eighteen months ago, bonded the property in January, 1905, and last January took up the bond and paid $30,000, and a company has been organized for development. The principal claim is the Leadville, which has an average width of five feet, and has been partly developed by a shaft 160 ft. deep and a tunnel now in 565 ft. Three separate vein systems are traceable on the group, the principal vein on the Leadville being an extension of the Pinnacle, from which a large tonnage was formerly treated at the Black Bear mill, and some pockets of ore rich in gold were extracted. A 14-ft. vein traverses the Galena and Galena Fraction claims, the ore assaying $7.50 per ton, principally gold. The Denver City has a vein opened in five different places, showing an average width of three feet of gold ore. All of the veins carry some galena and a little silver. On the Leadville 80-ft. level a drift was run 70 ft., showing the vein four or five feet wide, the ore assaying $100 per ton. The company has arranged to spend $50,000 for development before ordering machinery. It is expected the company will acquire the right of way through one of the Pinnacle tunnels, drive 1,000 ft. on the Leadville vein and incidentally prospect others on the group. On the Galena a tunnel has been driven 100 ft., which will be pushed 200 ft. further to crosscut the vein at a depth of 300 ft.. The claims of this group have been prospected by John Judge, the original owner, for 19 years.

The tunnel on the Q. S. mine has advanced 900 ft. and crossed 78 ft. of the main vein, the ore averaging $10 per ton in copper and gold. Of 55 assays, 36 ran over $40, and 19 ran $13 per ton. Several other samples were lower. This vein crops from 100 to 300 ft. wide. The tunnel cuts the footwall at a depth of 600 ft. For a considerable length the cropping forms a perpendicular face, rising 150 to 200 ft. above the surface. This property is owned by the Q. S. Gold Mining and Smelting Co. A. M. Dewey is president and general manager. F. Moritz, formerly in charge of the Belle mine, in the Coeur d'Alene, for Finch and Campbell, of Spokane, Wash., is superintendent. The Q. S. group consists of a solid block of claims 4500 ft. long and 3600 ft. wide. Six men are employed, and the force will be increased as soon as room can be made for the men. The old log buildings of the camp will be replaced by stone structures. The company has a water right and six mill sites on Sinlahekin creek, and at the falls of the creek, a mile distant from the mine, will be placed a turbine wheel, and an electrical plant and pole line will be established for transmitting power to drive drills at the mine. It is planned to begin work this summer with an initial capacity of 1000 h. p. The construction of a mess, bunk and store-house will be one of the first things done. Connection can be made with the Vancouver, Victoria and Eastern branch of the Great Northern system by building a spur from the north end of Palmer lake, nine miles to Loomis and thence eleven miles to the mine.

The Capitol Mining and Milling Co., owning five claims in the Methow district, is sinking a shaft. A crosscut at a depth of 60 ft. shows the vein 37 ft. wide, with ore averaging $14 per ton in gold. A tunnel is being driven to cut the vein at a depth of 200 ft., which it is expected will be finished about June 20. The ore will be concentrated. Work is now being conducted with two shifts.

The Prize Mining Co. is constructing a box chute from the brow of the hill, above the Similkameen river, 2000 ft. in length, to the base of it. Formerly the ore was dragged down the hill. The mill is running and producing rich concentrate.

The Rainbow group of claims on Palmer mountain, one of the oldest in the district, has been re-located by two prospectors, who found galena ore in a shaft at a depth of 35 ft.

Republic, April 27.

(Special Correspondence).—The Napoleon Mining Co. has struck the main vein in their tunnel. They will now increase their shipments materially. For some time past three tons per day have been sent to the smelters from the upper workings. An open fissure, 325 ft. deep, has been encountered. The company is arranging to put in an aerial tramway, to convey ore across Kettle river, and the Washington and Great Northern railway will construct a siding for the company's use.

It is reported that $180,000 has been deposited with the First National Bank of Chicago for an option on the Verde Antique marble quarries on Huckleberry mountain near Valley. The Verde Antique Marble succeeded the United States Marble Co., and owns 400 acres of marble. It has produced marble in great variety of color.

Republic, April 28.

STEVENS COUNTY.

The Dominion Hill Mining Co. has taken over two claims near Addy which it has been operating. The working force will be increased. A shaft is down 100 ft. on the vein, and shipping ore is being stoped on that level. It is planned to sink and stope to a depth of 300 ft. A wagon-road will be built, after which the haulage of ore to the railroad will begin for transportation to the smelters.—At the Easter Sunday trouble between the stockholders of the Waukegan and Washington Mining and Smelting Company, the owners, has been reconciled and work will be resumed immediately. At the Summit, six miles northeast of Orient, N. T. Johnson, of Spokane, Wash., the owner, is starting development.—The Central group is under bond to California people. It is situated on the northerly end of Jumbo mountain, about eight miles east of Orient. This section is recently receiving a good deal of attention from capital.

Orient, April 21.

CANADA.

NORTHWEST TERRITORY.

That the Guggenheims are interesting themselves in far northern British Columbia, is the latest news to follow the advent of Heinze into Kootenay and the Bulkley valley. The Guggenheims have recently acquired the Consolidated Cariboo and are now, it is reported, invading Atlin.

S. H. Plumbe, superintendent of the McKee Creek Hydraulic Co., Atlin, has returned from a trip east, in course of which he visited New York, Ottawa, and other points, and has several interesting things to say about mining in Atlin. The company he represents is making great headway. F. T. Hamshaw, president of the company, who brought down a large nugget the fall before last has purchased the interests formerly held by Mr. Ginaca, which gives entire control of the creek and water-rights to the company.

Mr. Plumbe, while in New York, heard many things that indicate the rapid advance of Atlin in the favor of well known mining men. He heard it stated in various quarters that the Guggenheim company has been taking a lively interest in Atlin and purposes putting in two electric or steam shovels, taking electric power from the British American Mining Company's powerhouse, on two different parts of Pine creek. The steam or the electric shovel works in dry ground. The first steam shovel to go up there was installed by the Northern Mines, Ltd., last season. The advent of the Guggenheim company marks an important stage in the development of the Atlin camps.

Mr. Conrad, of Windy Arm, on the borders of Alaska and the Canadian Yukon, has returned from London where he went to organize capital for more extensive operations on his properties. The mission to London was successful, and Mr. Conrad is now on his way north with an assured prospect of a busy and prosperous season. Windy Arm is reached from Whitehorse, and surveys which will lead to the opening up of the country have already been made. This camp will soon be one of the busiest in the north country.

A letter from L. T. Watson, of Queen Charlotte Island, to a member of the Vancouver World staff, states that Eugene Knapp, the representative of a Seattle syndicate who held an option on Mr. Watson's claims on Graham Island, has closed the deal at $80,000 and has started men to work. At the time of writing, April 4, it was Mr. Knapp's intention to leave Skidegate on April 7 or 8, for Vancouver, to purchase a complete outfit. Mr. Watson says that he has made a new strike on Harriet harbor, from which he expects big results.

YALE DISTRICT.

The total output of the mines of the Kootenay, all districts, for the week ending April 13 was 35,225 tons, and for the year to date 495,300 tons. This was made up as follows:

Boundary—Granby, Emma, Mother Lode, Brooklyn-Stemwinder, Rawhide, Sunset, Strathmore, Rambler, and Preston, the last-named being a new shipper this year, totally 26,012 tons.

Rossland—Centre Star, Le Roi and Le Roi No. 2, 7,724 tons.

Slocan-Kootenay—St. Eugene, 712; Sullivan, 500; La Plata, 37; Eureka, 90; Hunter V., 78; Broadview, 25; Whitewater, 19; Sunshine, 22, and British Empire and Green Horn, new shippers, three tons each, on trial.

The smelter receipts of ore for the week were as follows:

Hall mines, 788; Marysville, 500; B. C. Copper, 4,348; Dominion Copper, 4,697; Trail, 8,463, and Granby, 16,580.

There were no incidents of importance during the past week in the mines. The development of the Centre Star continues to yield good results. This is particularly the case with the tenth and eleventh levels of what was formerly the War Eagle. The task of connecting the Centre Star and War Eagle is in progress, a crosscut being run from the Centre Star to connect it with the War Eagle and connections have been made from the ninth level of the War Eagle and from the sixth level of the Centre Star. The object of this is so that all the hoisting may ultimately be done from the Centre Star shaft, and do away with the hoisting from the War Eagle shaft. The shipments for the week ending this evening were: Centre Star, 4,320 tons; Le Roi, 2,430 tons; Le Roi No. 2, 570 tons; total for the week, 7,320 tons; total for the year to date, 93,385 tons.

Alexander Beyers and a companion ventured into a drift on the 1650 level of the Le Roi mine at Rossland one day last week shortly after a round of holes had been exploded. The gas proved too much for Beyers, and he was overcome and became insensible. His companion, Caesar, picked Beyers up and carried him to the bottom of the winze and then up a ladder way in the winze for 70 feet. Here Caesar became exhausted by his exertion and the effects of the powder gas and came near falling with his burden to the bottom of the winze, which has an angle of 65 degrees. No matter what might happen to himself, Caesar determined to save Beyers, so he took some fuse he had with him and tied the insensible man firmly to the ladder. Then he made his way to the level above and soon had the help of several miners. Beyers was quickly brought to the surface and sent to the hospital. It took several hours to get him in a comparatively comfortable condition.

Temporary Addresses of San Francisco Firms and Professional Men.

ADAMS, W. J., 2902 Bush St., San Francisco.
ALLIS-CHALMERS CO., 906 Broadway, Oakland.
AMERICAN TOOL WORKS, 4153 20th St., San Francisco.
ASBESTOS MFG. & SUPPLY CO., 1834 Ashby Ave., Berkeley.
BAKER & HAMILTON, 113 Berry St., San Francisco.
BALFOUR, GUTHRIE CO., 714 Broadway, Oakland.
BARNHART & SWASEY, 878 Broadway, Oakland.
BOESCH LAMP CO., 1569 Grove St., San Francisco.
BOSQUI, F. L., Ross, Calif.
F. W. BRAUN & CO., 2513 24th St., San Francisco.
BROWN, R. GILMAN, Sturgis Warehouse, 2031 Sutter St., San Francisco.
BROWNELL, J. S., 29 Jordan Ave., San Francisco.
BUTTERS, CHAS., 10 Bacon Block, Oakland.
BYRON JACKSON MACH. WORKS, 18 Telegraph Ave., Oakland.
CALIFORNIA PERF. SCREEN CO., 1300 Arch St., Berkeley.
CALIFORNIA HYD. ENG. & SUPPLY CO., 1169 Jefferson St., Oakland.
CALIFORNIA ORE TESTING WORKS, 364 Bay St., San Francisco.
CHROME STEEL WORKS, 1736 Walnut St., Berkeley.
COMPRESSED AIR MACH. CO., 415 Fillmore St., San Francisco.
DENNISTON'S S. F. PLATING WORKS, 3454 21st St., San Francisco.
DEWEY, STRONG & CO., 10 Bacon Block, Oakland.
GEO. E. DOW PUMPING ENGINE CO., 3116 Washington St., San Francisco.
FAIRBANKS, MORSE & CO., 969 Broadway, Oakland.
FALKENAU ASSAYING CO., Polytechnic Business College, Cor. 12th & Harrison, Oakland.
FORBES, JOHN F., 601 Kohl Bldg., San Francisco.
FULTON IRON WORKS, Harbor View, San Francisco.
W. T. GARRATT & CO., 2398 Broadway, San Francisco.
JOSHUA HENDY MACHINE WORKS, Bay & Kearny St., San Francisco.
HARRON, RICKARD & McCONE, 2nd & Clay St., Oakland; 7th & Berry St., San Francisco.
HARMON LUMBER CO., S. H., 1st & Brannan St., San Francisco; 1921 Fillmore St., San Francisco.
HEALD'S BUSINESS COLLEGE, 1451 Franklin St., San Francisco.
HENSHAW, BULKLEY & CO., 1010 Washington St., Oakland.
J. C. HOWLETT MACHINE WORKS, 1014 Buena Vista Ave., Alameda.
HOFFMAN, ROSS B., 566 31st St., Oakland.
HOLMES, GEO. L., 143 Santa Clara Ave., Oakland.
HUNT, BERTRAM, care of H. F. Eckert, Esq., 750 59th St., Oakland.
JANIN, STEBBINS & SMITH, McDonald Bldg., Oakland.
KROGH MFG. CO., 2506 Sutter St., San Francisco.
A. LIETZ & CO., 918 Broadway, Oakland.
LUCKHARDT, C. A., 723 Paru St., Alameda.
McMASTER, D. J., 512 Folsom St., San Francisco.
MEESE & GOTTFRIED CO., 1332 McAllister St., San Francisco.
A. MERLE & CO., Bay & Stockton St., San Francisco.
MOORE & SCOTT IRON WORKS, 412 Main St., San Francisco.
MOUNTAIN COPPER CO., 1020 14th St., Oakland.
CHAS. C. MOORE & CO., 417 14th St., Oakland.
GEO. W. MYERS, 1736 Walnut St., Berkeley.
R. N. NASON & CO., 15th & Utah St., San Francisco.
NATIONAL WOOD PIPE CO., 518 11th St., Oakland.
NOYES, W. S., Room 25, Albany Block, Oakland.
NEVADA METALLURGICAL WORKS, 723 Paru St., Alameda.
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RIX COMPRESSED AIR & DRILL CO., 1222 Franklin St., Oakland.
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Notices of Recent Patents.

Dewey, Strong & Co. have offices at 10 Bacon Block, Oakland.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press United States & Foreign Patent Agency, the following are worthy of special mention:

BASEMENT AND LIKE VENTILATOR, No. 818,889 April 24, 1906, P. H. Jackson, San Francisco, Cal.

This invention comprises in a vault and like ventilator, a casing fixed in the covering surface, a cover therefor having exterior openings, a central closed portion with a circular flange extending down from its lower surface, an angular closed bottom to the casing, with a central opening and an upwardly extending surrounding rim, a sleeve turnable and vertically movable upon the rim, and closable against the cover flange, said cover flange being concentric with and adapted to inclose the upper end of the turnable sleeve when said sleeve is in its elevated position, said flange thereby serving to prevent water and dust from passing through the central opening to the basement.

FISHING REEL, No. 818,880. April 24, 1906, Wm. Ernst and Alva A. Patton, San Francisco, Cal.

This invention comprises in a fishing-reel, a frame, a shaft journaled therein, winding-gear and a crank connected with one end of the shaft, gearing fixed to the opposite end of shaft and a coil-spring actuated in unison with said gearing, a casing inclosing the spring and turnable by the shaft, a brake by which the casing may be arrested and the spring independently coiled and a winding-spool turntable upon the shaft and a clutch by which the spool may be connected to turn with the shaft or disengage therefrom.

BROODERS, No. 818,872. April 24, 1906, L. W. Clark, Petaluma, Cal.

This invention comprises in a brooder, the combination of an outer box, heating pipes passing through said box, a frame slidably mounted in the box and through which the said heating pipes pass, said frame having its ends cut away to accommodate the pipes, a removable cover for said frame, and a flexible sagging bottom for the frame, said bottom being in direct contact with the heated atmosphere of the heating-chamber and sagging to permit the backs of the chicks to come in light contact with it.

HORIZONTAL CYLINDER PISTON, No. 818,860. April 24, 1906, F. L. Bates, San Francisco, Cal.

This invention relates to improvements in pistons for engines in which the cylinder is of horizontal type, and is designed to relieve injurious wear and pressure of the piston upon the bottom of the piston. It comprises in a horizontal cylinder, a piston reciprocable therein, said piston-head having the upper and larger portions of its circumference normally with a smaller radius than that of the cylinder and the remaining portion normally upon the same radius as that of the cylinder-bore, snap rings fitting grooves in the piston, and having their separated ends fixed within the space covered by the larger arc of the piston-head.

GOLD SAVING APPARATUS, No. 818,834. April 24, 1906, I. P. Lambing, Denver, Colo.

This invention relates to a device for saving gold in placer, gravel, or hydraulic mining where free gold is to be found. It comprises in a gold saving apparatus, a means for separating gold from associated mineral, said means consisting of a sluice having a bottom composed of a series of rapid inclines and intermediate dams arranged substantially at right angles with the plane of the sluice, with mercury-containing channels at the junction of the lower edges of the inclines and the bases of the dams, and other mercury-containing channels located between the upper edges of the inclines and the faces of the dams and below the upper edges of the dams.

Commercial Paragraphs.

The Nissen stamp mill, handled by Fairbanks, Morse & Co. of Chicago, is being given a trial at the plant of the Boston Consolidated Company, at Bingham, Utah.

The Trenton Iron Co. has issued a new circular illustrating the Bleichert system of rope tramways.

The Smooth-On Mfg. Co., Jersey City, announces that their No. 5 Instruction Book will be sent free on application.

The California Perforating Screen Co. will locate at 367 Harrison St., Oakland, and in about three weeks will undertake to punch metal.

James C. Bennett has resigned as assistant chief engineer of the Selby Smelting & Lead Co., and will take charge of the smelting machinery and equipment department of the Risdon Iron Works. The Risdon announces that they will enter actively into the smelter field.

The Fulton Iron Works of San Francisco announce that their works escaped damage and they contemplate the construction of a new machine shop to handle the increase in business.

R. C. Berkeley has resigned as Pacific Coast representative of the Minneapolis Steel Co. and is now head of the Berkeley Steel Co. with temporary address 1694 Post Street, San Francisco.

Harron, Rickard & McCone are erecting a two-story temporary office building on their warehouse site at 7th and Berry St., San Francisco. They will occupy these new offices about May 10.

The offices of the Brunswick Consolidated Gold Mining Co., the Viloro Syndicate, Ltd., are now on the second floor of the Sturgis warehouse at 2031 Sutter St., San Francisco.

The Robins Conveying Belt Company, Park Row Bdg., New York, have issued an attractive and interesting bulletin on the conveying and handling of excavated earth, rock and concrete materials. This bulletin gives valuable information in a clear way.

The Wellman-Seaver-Morgan Company, of Cleveland, Ohio, has issued a splendidly illustrated and attractive catalog on Electric Hoists.

The control of the Engineering Agency, Incorporated, Chicago, has been purchased by A. G. Frost. In addition to branch in Pittsburg, the Agency contemplates placing representatives in New York and Denver, and the head of the Mining Department of one of the prominent western mining schools will probably have charge of the Agency's western business.

Latest Market Reports.

ANGLO-AMERICAN SHARES.

Cabled from London.

	April 26. £ s d	May 3. £ s d
Camp Bird	1 4 3	1 4 0
El Oro	1 5 0	1 5 0
Esperanza	3 18 9	3 18 9
Dolores	1 7 6	1 18 9
Oroville Dredging	0 17 4½	0 17 6
Stratton's Independence	0 7 0	0 7 0
Tomboy	1 7 6	1 6 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By Wire from New York.

	Average during the month of April.	Average for week ending May 3.
Lake	$18.69	$18.62@$18.75
Electrolytic	$18.38	$18.25@$18.50
Casting	$18.14	$18 @$18.25
Lead	$ 5.40	$ 5.50
Spelter	$ 6.08	$ 6.05@$ 6.10
Silver	$ 0.6477	$ 0.66

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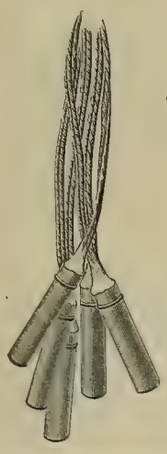

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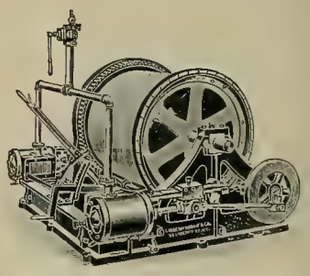

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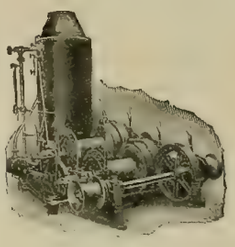

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EDITORIAL.

THE MAKERS OF machinery and those who deal in machinery have suffered from the San Francisco fire by reason mainly of the loss of drawings. Most of the firms in the City have their foundries and shops on the outskirts, so that these escaped the conflagration, but all had offices in the business portion of the town and mostly along Market and Mission streets, where the fire raged. With characteristic enterprise, these firms are already at work, making and designing the machinery needed in the mines of the West. They are under the direction of the men who made San Francisco a great mining center, and no temporary disorganization or financial loss has served to stop their business. We make a suggestion to our professional friends and that is, that they return any blue prints or tracings that they have obtained during the last year from San Francisco firms, since these drawings may prove of great service. We limit the age to one year, for it is obvious that our progressive clients have no use for designs that are older than that.

A QUINQUENNIAL CENSUS shows that the population of Baltimore has continued to grow at practically the same rate as before the fire that almost destroyed it. In 1901 the local census made the total 517,035, while the Federal Census of 1900 gave Baltimore 508,957. Through an enumeration carried out by the police, it is found that the population in 1906 is 543,034, showing an increase of either 25,999 or 34,077, according to which of the statistics of five years ago is taken for comparison. Baltimore increased by 74,806 only in the ten years between 1890 and 1900. therefore there has been no falling off. There has been a decline in the ratio of negroes, the new population containing a larger proportion of whites than formerly. These facts offer substantial encouragement to our people here.

WE ARE ABLE to state authoritatively that the erection of the large copper smelter at San Bruno point, particulars of which were given in our issue of April 14, is in no wise affected by the San Francisco conflagration. On the contrary, the work is being pushed with additional energy. The original plans included only one brick building, so that the possibility of another serious earthquake will cause no serious change in the construction. It was intended to erect a brick chimney, 380 feet high, and this detail will be amended; a self-contained anchored steel stack will be substituted. The fact that this large plant will be built without delay is one of much importance to this community, for it will establ the importance of San Francisco as a metallurgical center and an ore market.

THE ADOPTION of a uniform eight-hour day in the mines and smelters of the Amalgamated Copper Company at Butte is an important event. It is a voluntary concession on the part of the great copper corporation and it ought therefore to create good feeling. The step was undoubtedly taken for sound reasons and while the loss to the company is stated at a large sum, it is more than likely that the men will do better work in return for their shorter hours. A man who works honestly for eight hours has done enough and if mine managers have fought the eight-hour movement, it is because they know that the time wasted by employees is such as to make the period of supposed labor much less than the hours indicate. A man who works his seven or seven and a half hours steadily out of the eight hours spent in the mine is more useful as a workman than one who, while underground for ten hours, dawdles or fools away a third of his time. Uniform hours and even short ones are not objectionable even from the employer's standpoint, if he can be assured of uniformly effective work. We welcome the announcement made by the managing director, Mr. John D. Ryan, that the Amalgamated Company will keep out of politics and has buried the animosities of the past. This is good citizenship and sound business.

PEDRO ALVARADO has served as the subject for plenty of inaccurate copy in the daily press. His Palmilla mine is three miles from Parral, in the State of Chihuahua, and it is usually credited with several times its actual production. Alvarado's father owned the mine and worked it in *gambucino* fashion; Pedro himself allowed lessees to come in, and it is they that five or six years ago found the rich ore. This discovery developed into a bonanza, 140 feet wide, so that the mine is making about $50,000 per month. Carloads have yielded $2,500 per ton, but the average is about 100 pesos or $50 per ton. Pedro Alvarado is no *peon* or peasant, but a *baratero* or miner, an important distinction in Mexico. He has built a house that cost a million pesos, and he has done other foolish things that have helped to create tales as to his great wealth. There are 3,000 men in his employ at the mines and these do the work that 1,000 could do, many of them being his old *compadres* and hangers on. Like most stories of the accidental rich, this one loses its romance on closer inspection.

The Need of a Library.

Professional men having offices and homes within the devasted area of San Francisco have suffered great loss by the destruction of their libraries. In extending a comprehending sympathy, we desire also to shake hands with the members of the San Francisco bar who have seen reference books of inestimable value consumed by the flames. And among those lawyers who have often disentangled the complications arising from our curious mining laws, we desire especially to tender sympathy to Mr. Curtis H. Lindley, author of 'Lindley on Mines' whose library was one that has helped many mining men during the years that are past. Men are greater than books, and we trust that the Judge is spared for many years of continued usefulness. The Bar Association of New York has given $5000, as a contribution toward the creation of the new library of the Bar Association of San Francisco. To the disputative profession, the loss of reference libraries is undoubtedly greater than it is to our own profession. To students all books have value, but to the practical engineer and metallurgist, only those that contain the most recent records of technical development are necessary. Technical books more than ten years old have little immediate value and the collections of superseded literature possess mainly a sentimental interest. Therefore the mining engineer's loss is less than the lawyer's, though bad enough.

In relation to this subject, we note that an appeal has been made for help in adding to the usefulness of the mining library started by a gift of money made by Mr. John Hays Hammond. Before the destruction of the City, there had been question whether the State Mining Bureau would or would not give space for these books in its quarters at the Ferry building, and the completion of the plan was hindered for lack of a suitable home. This hindrance is likely to be overcome now, for the need of such a library has been vastly emphasized by recent events. Mr. Hammond gave $5,000 for the purpose and it was arranged that Messrs. Charles G. Yale and Louis Janin

should be trustees, together with the State Mineralogist, ex-officio.

An appeal is being made by the trustees, all of whom are representative men, asking for volumes of scientific and technical papers, and inviting suggestions in regard to the books to be purchased. We think it likely, having regard to the widespread loss caused to the professional men of San Francisco, that several technical and engineering societies such as the American Institute of Mining Engineers, and the sister societies that represent mechanical, electric and chemical engineering will, if practicable, donate a set of their own publications. We also suggest that our friends in London, Melbourne and Johannesburg are good fellows, who, in view of the particular conditions of the case, would be likely to do their best in this regard. The best we can do at this time is to state to those mining engineers, geologists and metallurgists who are willing to help, that the address to which they can forward books is 81 Appraiser's building, San Francisco, in care of Charles G. Yale. This is the most effective help they can offer their professional brethren of San Francisco.

Railroad Building in Alaska.

The mineral development of Alaska awaits the construction of several necessary lines of railway and it appears likely that this means of transport will be largely available in the near future. At present the longest line is the White Pass & Yukon Railroad, from the coast at Skagway to White Horse, where connection is made with a water route to Dawson. This road, famous for the engineering skill with which it was constructed and for the impressive scenery it traverses, is only 110 miles long. There are three short railways on the Seward peninsula: At Nome there is a 12-mile narrow gauge road that runs to Anvil Creek; another narrow gauge, a few miles long, connects Council and Ophir Creek; the Council City & Solomon River Railroad is standard gauge, and 16 miles long. This is an insignificant amount of railroad building for a region so vast, the natural resources of which have been abundantly proved. Of course, the great river system of the Yukon has furnished transport from, and to, the interior, but owing to the shortness of the summer and the difficulties of navigation, this affords but a precarious highway for traffic.

On another page we publish a map indicating the route of the railroads projected for the development of Alaska. Some of these are assured in the near future and all of those indicated will undoubtedly be built within the next five years. Among the railroads first to be built is that which will tap the Copper River district, and proceed thence to Eagle City on the Yukon. The line will be about 500 miles long, starting at Valdez on the coast. From Valdez it is likely to be brought eastward so as to cross the Copper river and follow the water gradient northward to the Yukon. A branch line will go to the copper districts of Bonanza and Elliott creek. It has been suggested that the terminal point should be at Orca, near the salmon canneries, and that a short branch should tap the coalfields on Controller bay. These projects are in the hands of men well able to realize them, so that we anticipate rapid construction. Another railroad is to go from Resurrection bay to Fairbanks, on the Tanana river, serving as an artery to that gold mining district, which yielded $5,107,000 in 1905 and is today the most productive in Alaska. A few miles of track have already been laid from Resurrection bay along the Sushitna river; this line will go up the Sushitna and down the valley of the Cantwell river to the Tanana; eventually it may be extended to the Yukon, at Rampart. The total length will be fully 550 miles. A third railroad will cut across the Alaska peninsula, saving the tedious and often dangerous circum-navigation by way of Unalaska to St. Michael. The road will proceed northwest from Lliamna on Cook Inlet to Anvik, on the Yukon, and not far from its debouchure into Bering Sea. The length of rail to be laid is about 375 miles. Each of these roads will perform specific functions in affording facilities to mining centers already established, but beyond this they will undoubtedly afford new points of departure for exploratory work and in this way they will advance the further development of new regions. The importance of railroad facilities for this purpose warranted the request recently made to Congress for subsidies in aid of construction, but the committee on railroads rejected the bills intended for this purpose, on the sufficient grounds that Federal aid was not needed, there being every reason to believe that ample private capital would be forthcoming. This we believe to be a fact.

But beside land transport, the Territory needs adequate steamship service between the railroad terminals on the coast and the ports to the south, such as Seattle and San Francisco. At present merchandise from San Francisco destined for Nome, St. Michael and the Yukon valley is transshipped at Seattle, but in June a new line of three steamers is to be put on a direct service from San Francisco to the northern ports mentioned. At Seattle, four new steamships are shortly to be utilized to carry freight to Valdez and Nome. Therefore the arrangements for Alaskan traffic are destined to undergo rapid improvement. The development of the region warrants it, for no part of this continent gives better assurance of growing in value as a source of mineral wealth If our people exhibit the enterprise to be expected of them, San Francisco will be the gateway for the receipt of much of this metal output and the distributing point for the machinery and supplies necessary in such productive operations.

When converting pounds sterling into dollars, most of us do it mentally by multiplying with five, which is well enough. But many statistics are seriously vitiated by this careless habit: for a pound is never equal to five dollars. We know of an instance where the price of a mine was ten million dollars United States currency; the promoters in London divided ten by five and remitted two million pounds, only to find out at the last minute that they were $300,000 short—quite a tidy sum, enough to buy a pretty good mine. The error was rectified but not without some scurrying to and fro among casual arithmeticians. While the rate of exchange varies from day to day, in converting statistical data we multiply pounds by 4.85 to arrive at the equivalent dollars. Speaking of such matters, it has become the custom lately to use the term peso in place of the 'Mexican dollar' so as to prevent confusion with the dollar of the United States and Canada. But when we come to the smaller currency we note that 'cents' are still qualified by 'Mexican' or 'American' as the case may be. This occurs in giving the cost of minor articles of commerce or of cheap forms of labor We suggest the use of *centavos* for Mexican small currency and of cents for the American. Thus we shall have the *peso* and the *centavo* in contradistinction to the dollar and the cent. This usage should prove simple and safe.

By the Way.

In 'Popular Science Monthly' Mr. Joseph H. Bair, Professor in the University of Colorado, makes interesting observations on the 'Individual Adaptation to Environment.' He says that as a result of the incorporation into his environment of his cumulating knowledge, man's social and economical conditions are continually changing, but with his increased intelligence he has greater power of adapting himself to the new conditions of life which are inevitably the result. And as soon as man acquired those intellectual and moral qualities which distinguish him from the lower animals, he began to invent weapons, tools and various stratagems to procure food and to defend himself, and was but little liable to bodily modification through natural selection. When he migrated into colder climates he used clothes, built shelter, made fires. He also aided his fellows and anticipated his future. Selection seized upon intelligence and man was enabled to keep an unchanged body in harmony with a changing environment. Progress implies a continued increase of control over nature, through the gradual acquisition of knowledge of her laws.

Education, too, succeeds in maintaining the intellectually unfit by adapting them to the environment intellectually unfit by adapting them to the environment so that they are enabled to make a living and to bring up a family, thus precluding a rise in the average of intelligence in the race. Man is enabled to advance independently of heredity, and natural selection is cheated out of her work. Man can select everything in his world except his own body and mind. He is born with a body and mind which were developed by natural selection and are naturally adapted to the environment that existed when selection ceased. So adaptation to the environment in which he is called upon to live (civilization) must be accomplished through artificial means.

Civilization implies that each generation is working at a higher environing intellectual, moral and spiritual level, and with better tools, which their predecessors from generation to generation have devised and handed down to the subsequent one with usury. The essential thing in progress is that evolution has been transferred from the organism to the environment and that it is the accumulated social structure which persists. Civilization, therefore, is better characterized as a product than as the continual rise of average intellectual capacity. This product is the mold in which mediocrity is cast, and implies, merely, that the level of acquisition is becoming higher rather than the level of intelligence. The mediocre, and even the mentally poor, as well as the apt, are by means of education adapted to their environment and are thus enabled to survive and to bring up a family. Here, too, natural selection is barred from functioning, and for this reason man's mental evolution tends to a limit. One feature, inevitable in education, and which distinguishes social evolution from merely organic evolution, is the predominant part played by the fittest in raising the level of the less fit.

The question comes, can the scholar keep abreast with the times? The most strenuous effort will almost invariably fall short of its attempt. Our ideas integrate into a system. An apperceptional something functions in all intellectual life. The ideas in our minds are the standards by which we receive new truths and ideas. We crystallize into our notions about things; in other words, we form habits of thought as well as of action, and thus become fixed in our theories and attitudes. Considering, therefore, the fact that every subsequent impression upon the mind of a person is viewed in the light of what is already in the mind and fixed, it is not difficult to see why it is almost impossible for that mind to accept an entirely new point of view, no matter how reasonable that point of view may seem to one whose ideas as standards are in consonance with the new view-point.

Often it happens, however, that scholars are far ahead of their times. They are dreamers or prophets. They anticipate a more or less distant future, and their thoughts and standards all integrate into a system consistent with their point of view. There are only a few whom they can interest in their lofty conceptions. The man most popular in his time is he who gives expression to what the world gropes after, who lives what they feel, who makes their felt wants real. But the environment, intellectually as well as physically, is cumulative, and soon society will have outgrown him. He becomes obsolete. He has given them the means of stepping beyond him to a higher interest. They are now shouting to another hero who is helping them still another step higher in realization. The world keeps on shouting, but continually to new individuals.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

When adit levels are run to develop water, drifts should be run on every fissure and seam giving any indication of moisture.

Tinstone and wolframite frequently occur in the same veins, and consequently are found associated in placer deposits resulting from the degradation of such veins.

Acetylene lamps will burn in mines where candles are useless, owing to the presence of carbon dioxide, but it is dangerous for men to venture where a candle will not burn.

Micaceous iron (specularite) is frequently mistaken for galena. The former has a dark red streak, the latter a lead-colored to black streak. Free gold occurs with micaceous iron, and is occasionally associated with galena

That mine is most valuable which pays the largest profit with the least possible capital expense, and which is so situated geologically that when it is exhausted there is no doubt about it, thus offering no incentive to waste accrued profits in hopeless search for more ore.

It is a mistake to construct a mill or build a smelting plant with a capacity far in excess of the mine's ability to keep it supplied with ore. It is the wiser plan to build moderately at first and as the resources of the mine develop, the reduction plant may be extended to meet it.

Modern volcanoes do not erupt acid rocks, but east of Lassen Peak, California, at what is known as the cinder cone, there has occurred a flow of quartz basalt. The rock is fine textured, black and typical dolerite—the fine-grained basalt; but throughout the rock are scattered numerous small blebs of vitreous quartz.

To insure security all pipe-lines on hillsides and not buried beneath the surface, should be anchored to rocks, trees or to posts substantially set in the ground. Air-pipes also should be provided with expansion joints at suitable distances and, if there are any depressions in the line, these must be provided with valves for the escape of condensed water.

The 'caving system' of mining as practiced in the iron mines of Minnesota is not applicable to mines everywhere. In those mines occur peculiar structural and geological conditions which make the caving system particularly applicable, but without suitable conditions the application of this system would not only become extremely dangerous but a financial blunder.

Mine waters are a source of expense in most cases, but there are many instances where the water pumped from a mine may be utilized to good advantage, in treatment of the ore. For the purposes of concentration mine water may always be useful, but in treatment by amalgamation, minerals in solution in the water often interfere seriously, due to the presence of arsenic, chiefly, or sulphuric acid.

At some mines, mispickel is treated successfully by stamping, amalgamation and concentration, followed by straight cyanidation of the tailing, the concentrate being shipped and the tailing cyanided without roasting. In instances where the arsenical ore is too low-grade to admit of shipping at a profit, it would perhaps be the better plan to roast the ore before cyanidation, and then to use bromo-cyanide.

Most new mining districts are discovered by accident. The reason for this probably is that prospectors are inclined to search for conditions with which they have become familiar elsewhere, passing by all other occurrences as of little value. The discovery is often made by one entirely unfamiliar with geology and unprejudiced by previous experience. For this reason valuable mines are sometimes discovered in most unexpected places.

The State of California has few mining laws which add to the requirements of the Federal statutes. The legislature has passed no law which is at present in effect requiring that a certain amount of assessment work be done within 90 days of the date of location, as a part of the act of location; though Arizona and Nevada have laws of this kind. One may safely follow the United States mining laws of California.

Pocket hunters become very expert in tracing 'colors' to their source. They work according to conditions as they find them Some pockets are quickly found while others require long and persistent effort. An expert pocket hunter would naturally be expected to find a pocket from the indications sooner than a novice. It is a business requiring judgment and this only becomes mature with experience.

Owners of prospects often appear to forget that the actual value of their properties may possibly be far below the price fixed by themselves. Owners often hold such exalted ideas of the value of their property or their ores that it is impossible to do business. Claim owners sometimes read the quotations on the retail price of metals and expect to get this price or near it, for their raw product. This is, of course, an impossibility, as the smelters do not, as a rule, receive retail prices.

All kinds of sedimentary rock are known to be goldbearing in various mining districts. In California, gold occurs in limestone in the Black Hawk mountains of San Bernardino county; in sandstone in the Black Hills of South Dakota and in Colorado; in shale in Utah, and in crystallized lime at the Alvord mine in California. The metamorphic sedimentary rocks are also notably goldbearing in many places. Quartzite, slate, mica schist and marble are well known carriers of gold.

It pays at every large mine to have a complete machine shop and in some places the magnitude of operations justifies a foundry as well. In the former, repairs of every description can be made from turning out a new rocker pin for a machine-drill to welding a stem, or turning a shaft in the lathe. Cars, cages and skips also may be built to advantage in the company's shops. In the foundry all of the heavy castings can be made on short notice, and not only money but often much delay saved. Particularly is this the case at mines in an isolated situation, far from railroads.

It is not the number of blows a machine-drill strikes within a given time, altogether, that counts for progress, but also the air pressure back of the drill. In addition to this, the proper manipulation of the machine by the drill runner, is not the least important factor. A chuck-tender of two weeks' experience can scarcely be considered a competent machine miner, yet, not infrequently, such men secure situations with no more experience than that mentioned. Some mine superintendents prefer to break in and train their machine-men, claiming that the general result in the end is far more satisfactory.

The word porphyry means purple, and is the name originally applied to the purple colored rock from which many Egyptian obelisks were made. As applied to rocks, it has only structural significance. As now understood, porphyry is any rock in which distinct crystals of any mineral occur which are larger than the grains or crystals of the ground mass. The ground mass may be very fine in texture or may be quite coarse. A fine-grained, dark-colored rock in which occur white crystals of feldspar is porphyry; a fairly coarse granite in which occur crystals of feldspar an inch or two in length is also porphyry. There is also quartz-porphyry, hornblende-porphyry, feldspar-porphyry, etc. Porphyrite is a name applied to basic rocks having a porphyritic structure, as diabase-porphyrite, or diorite-porphyrite and others.

It is generally conceded by authorities that the existence of open spaces is necessary for the formation of ore deposits of any kind. These open spaces may be extremely minute, interstitial openings in a fractured, crushed rock mass, or they may be of considerable size in a coarse breccia. The ore may have been deposited in these open spaces between the pieces of the fractured rock mass or in the small cavities between the grains of porous rock, as sandstone. Some ore deposits undoubtedly have been formed by replacement—that is, as the mineral-bearing solutions passed through the rock, atoms of the rock mass were dissolved and carried away in solution, being replaced by atoms of the sulphide minerals now constituting the ore deposit. Bodies of lead, iron and zinc sulphide in limestone are typical of this method of formation, while deposits in sandstone are well illustrated in many California quicksilver mines. There is nothing to support the belief that the spaces now occupied by large ore deposits were at one time open caverns.

There are no means by which the 'drift' of a diamond-drill hole may be anticipated, though instruments have been devised by means of which their departure from a true course may be measured after the hole has been bored, or during the progress of the operation. One hole bored through given strata may drift to one side 100 ft. or more in 1000, when another hole in the vicinity passing through practically the same strata may have a very small departure from the original alignment. Holes started horizontally always drift upward, due to the fact that the cutting bit is slightly larger than the pipe line connecting it with the drilling machine, the pipe sagging a little in the bore-hole, causing the bit to work upward slowly.

Although a Colorado district court recently decided that locators of mining claims who have failed to do the annual assessment work prescribed by law in order to hold title to the same, have the right to re-locate the same as any other party who may jump the claims after the first location becomes void by reason of failure to perform the necessary work, holding that re-location would hold good at law, providing it was made before the location by the other parties after the first location had become void. It is doubtful if the United States Supreme Court would sustain this decision on an appeal. Such a ruling would have the effect of subverting the intent and purpose of the law, and the claimholder who fails to perform his annual assessment as required by law, would simply profit by his own negligence and hold his claim indefinitely without any development. Re-location once each two years would suffice to hold the claim indefinitely.

The law of Montana (Comp. St. 1887, div. 5, ss. 492-294), providing that the officers of a mining corporation shall have no power "to sell or otherwise dispose of" the whole or part of its mining grounds, mills, and plant, without such transfer being first approved by the holders of two-thirds of the stock, at a meeting at which at least three-fourths of the stock is represented, and that, if such sale be of the entire corporate property, the corporation shall be dissolved, is merely a limitation of the common law powers of directors and majority stockholders of a corporation, and does not authorize two-thirds of the stockholders of a prosperous company to sell all of its property against the protest of the other stockholders, or any of them. A transfer of all the property of a corporation to a foreign corporation organized by the directors of the former to acquire its property, in consideration of the latter assuming its liabilities, and agreeing to deliver to it its entire stock, stockholders of the former to exchange their stock for shares in the new company, or in lieu thereof to receive a fixed sum per share for surrendering them, is neither a sale nor an exchange within said provisions, conceding a sale or exchange to be authorized by such law. This is the gist of a decision of the Montana Supreme Court in the case of Forrester vs. B. & M. Consol. C. & S. Min. Co.

Disputed Location. The case of A, B and C, contending for mine locations in Arizona, is somewhat complicated, but in our opinion the title still rests in A (the company). The question of abandonment is largely one of intention, and it does not appear from the statement of the case, made by B, that there was any intention on the part of A to abandon the property. B, as a stockholder, had a personal interest in the mine, and was in the employ of the company owning them. He did a portion of the annual assessment work, and was engaged in the completion of this work on the last day of 1905, and was still so employed on the first day of January, 1906, with the knowledge and consent, if not at the direction of A. The fact that A had no ready money with which to pay B for his labor would not affect A's title to the ground, and was merely a personal matter between B and the company, A. As A was showing good faith, in so far as the government is concerned, B had no legal right to re-locate the ground either for himself or another, and C had absolutely no business on the premises whatever, being a trespasser. As A owes B $500 for labor performed, it B cannot collect the money due him from the company, A, he may bring suit and attach the property, under labor lien law, but he cannot convert the claims to his own use by the act of location.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A CRITICISM AND A SUGGESTION.

THE EDITOR:

Sir—It seems to me that one of the reasons for a certain amount of the enmity toward science as represented by geologists and existing among the ignorant as represented by machine-drill runners like myself, aside from the frequent inability of eminent geologists to agree on important specific problems, is due fundamentally to the Huttonian method of reasoning. That is reasoning from the near to the remote.

The crime that I mean to impute is the general haziness and lack of proportion in which the whole subject of geology is enveloped, from the original formation of the earth's crust down to present ore deposits. To make my meaning clear, I will give a few quotations from 'A Treatise on Metamorphism,' by C. R. Van Hise, and criticise them from my point of view without intending to attack Mr. Van Hise particularly, but rather to show how geologists lay themselves open to criticism.

In speaking of the source of the material constituting limestone, Mr. Van Hise says: "The original dominant source of the calcium magnesium carbonates is mainly the many alkaline earth-bearing silicates." Now that is all very well, but when you question the source of the many alkaline earth-bearing silicates and reason on the same lines you can only come to the conclusion that the original crust of the earth is a slag or magma of a definite composition, calculated by Mr. Clarke to be composed of oxygen, 47.29 per cent; silicon, 27.21 per cent; aluminum, 7.81 per cent; iron, 5.46 per cent; down to the smaller percentages of other elements.

Further on Mr. Van Hise says: "The source of the water of the hydrosphere is uncertain. If any considerable proportion of the water of the hydrosphere was produced by the oxidation of hydrogen during the time the sedimentary rocks were deposited, the amount of oxygen thus consumed would have been enormously greater than the amount of oxygen now in the atmosphere." Then follow some pages showing the possibility of water being formed from the hydrogen which occurs occluded in various rocks and through action of solfataric springs, etc. In regard to oxygen he says: "It appears that the chief certain source of oxygen of the atmosphere is the reduction of carbon dioxide by vegetation and a burial of a part of this vegetation in the earth. This source is vast in amount." Now, why is it not more simple and more reasonable to suppose that the water of the hydrosphere was formed from the original gaseous sphere before there was any crust to the earth at all?

Let us skip a few hundred pages of matter that does not especially concern the miner, and take up the subject of ore deposits. In California I have found that if you ask a mine manager or superintendent where the ore came from to form any particular deposit, the chances are that, with a wave of the hand, he will state that it came from below. In Missouri, however, a different state of affairs exists. The mine manager says very distinctly, "We don't give a damn where the ore came from." Nevertheless, there is a certain amount of interest in the source of the metal of any ore deposit. Martin Schwerin, for example, in your issue of March 31, wants to know in several specific instances where the ore came from—whether above, below, or from the walls.

In this connection Mr. Van Hise states: "I have little doubt that the metallic constituents of ores are in large part derived from the igneous rocks which have been intruded into or extruded upon the lithosphere." Further on, after considering various iron, lead and zinc deposits, he says: "While it is held that the metals for numerous and important ore deposits do not have their immediate source in igneous rocks, it is recognized, as stated at the outset, that ultimately the metals for all ore deposits are probably to be traced back to igneous rocks." It appears to me personally that it might just as well be stated that the ultimate source of the metals is the original sphere of gas from which the earth was consolidated as far as any assistance is afforded to a man trying to extract at a profit the ore from any particular deposit. What is of more importance in Mr. Schwerin's case is this statement: "In the case of a given ore deposit, by wise combination of the criteria given, it is generally possible to make a somewhat reliable judgment as to whether or not the ore was produced solely by ascending waters. Criteria meaning many pages on circulation of underground waters, solubility of metals in various aqueous solutions, etc.

Now, if you will kindly give me the space, I will offer, subject to criticism, my own particular notions on the subject of ore deposits: Start with a spherical body consisting of equal parts by volume, in the gaseous condition, of all the known and unknown elements. As this spherical body began to cool, the gases began to condense, combine and precipitate according to a definite law. Those elements which combine most readily with oxygen precipitating first and in the same way that in chemical mixtures the compounds crystallize in such order, and the separated solid is of such character that the freezing point of the remaining liquid is lowered, and after one compound has separated another follows, which again lowers the freezing point, and the liquid left is the last compound to crystallize. Thus hydrogen combined with oxygen to form steam, and, later, water. Silicon formed particles of silica. Aluminum formed alumina; iron, magnesium, zinc and other elements followed in their regular order, until a crust was formed on the sphere of such a thickness as to interfere with the process. Smelting processes then began to take place locally owing to the continual contraction of the sphere and other causes; that is, sections of the crust plunged in just as cakes of ice are sometimes seen floating on edge or partly forced under. The smelting processes were not always complete. They were similar to the effect produced when fluxes are added to an assay-charge already melted or to a crucible of melted gold, and there is not enough heat from above to form a slag of new composition. This produced a great variety of igneous rocks and also introduced a certain amount of the heavier, less easily oxidized, non-oxidizable and more precious metals in the shape of prills from below into the range of the converter processes. The converter processes were due to the same causes and were going on locally at the same time as the smelting processes. To illustrate this idea, ignite two hundred pounds of fine zinc shavings on a breezy day and note the disseminating effect, or hang around a copper smelting plant and watch them over blow one or two converter charges, also notice the flue-dust and fumes. The smelter and converter processes continued during the formation of the so-called sedimentary rocks and the resulting fumes of the more readily oxidized metals, and metallic particles of the less readily oxidized and non-oxidizable metals were locally deposited in them and disseminated through them.

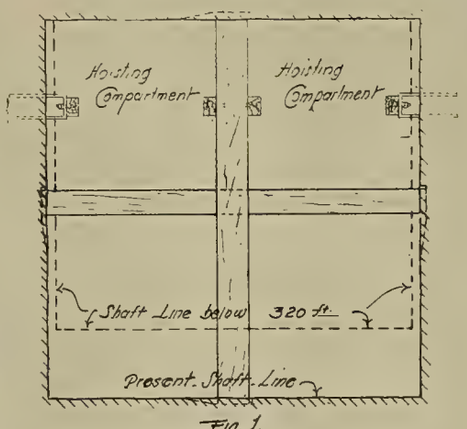


Fig. 1.

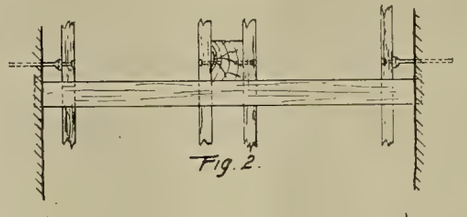


Fig. 2.

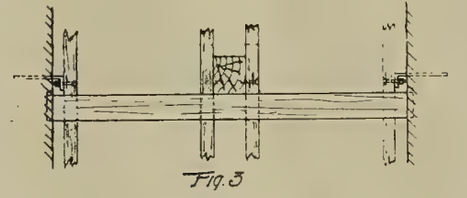


Fig. 3

That is to say: All primary ore deposits are the result of either the mechanical concentration of metallic particles and of relatively insoluble metallic oxides resulting from the erosion and decomposition of sedimentary rocks or else the result of the leaching of metallic particles, oxides, and salts through aqueous solutions, from the sedimentary rocks. The influence of intrusive bodies of igneous rock on currents of aqueous solutions of metals, through heat, and their action as barriers or as basements, has been brought out very well in the discussion following Franz Posepny's treatise on ore deposits, though there is still some cloudiness as to the nature of those aqueous solutions.

RICHARD C. HARRISON.

Tangier, Nova Scotia, April 18, 1906.

THE BEST SHAPE FOR A SHAFT.

THE EDITOR:

Sir—Another plan might well be employed in connection with the 10 by 10 ft. shaft, whereby the side buntons are done away with and brackets employed as a support for the guides, since the rock surrounding the shaft described by Mr. Burrows is so strong and coherent as to permit the use of such brackets. Let the center bunton be enlarged to such size that stiffness under the swing of the heavily loaded skip is assured, by the use of 10 by 12-in. timbers placed edgewise with the shaft; a single cross-bunton of smaller cross-section being used to separate the hoisting from the auxiliary compartments. To this main center bunton the interior guides are hung in the usual way by lag-screws. See Fig. 1, 2 and 3. At the sides of the shaft the guides are hung to brackets, single or double shanked, which are attached to the wall of the working by holes drilled at proper points, the shanks of the brackets being introduced into such holes and being permanently fixed therein by running in melted lead to fill up the interstices between the sides of the holes and the iron or even, possibly, by the use of cement. It is probable that the single-shanked bracket would be sufficient for all purposes and it would be more easily made and placed than would the double-shanked one. The face against which the guide would bear should be made perfectly flat and of a width equal to that of the guides. To such brackets the guides could be attached by means of stock bolts, double or lock-nuts being employed to prevent any possibility of their becoming loosened as with lag-screws.

A clearance of four inches would be ample where such brackets are used, and therefore with a center bunton of a width of 10 in. and a width of each hoisting compartment of four feet the shaft below its present depth could be narrowed three inches at each side, to a width in the clear of 9 ft. 6 in. With a width in the other direction across the hoisting compartments of 4 ft. 6 in., a center bunton eight inches wide, and with the subsidiary compartments narrowed in the same direction to a width of three feet, the width of the shaft in this direction would be 8 ft. 2 in. The cross-section of this 9 ft. 6 in. by 8 ft. 2 in. shaft would be 76.6 sq. ft. as against 80 sq. ft. for the 5 by 16 ft. shaft projected. Besides requiring the breaking of less rock in this construction a further economy would result in thus doing away with the necessity of making clearance for the side buntons in order that they may be brought to position and exactly aligned; with the use only of the center buntons, the squaring up of the shaft would be a less exact and therefore a more simple and rapid process than when even slight irregularities of the wall-rocks must be removed to accommodate the placing of side buntons.

The advantages of this construction, under the conditions advanced by Mr. Burrows, may be summed up as follows:

1. The shaft can be cut more readily to the required dimensions than can the single-width shaft.
2. It can be made even narrower than the assumed 10 ft., whereby a less quantity of material will be extracted than in the 5 by 16 ft. shaft.
3. A minimum of timber would be required to equip the shaft as thus constructed.
4. The brackets could be more cheaply and quickly placed than could the side buntons, and unless the iron should be subjected to the action of acid mine waters the brackets would be far stronger and more permanent than would the buntons.
5. By means of guide-bolts fastened with lock-nuts in place of the lag-screws the guides would be more securely and permanently held in place than could otherwise be accomplished.
6. Such a construction would be more economical in every way than would the application of side buntons or regular framed sets to the shaft.
7. Finally, the character of the rocks enclosing the shaft, as has been proven by other shafts at Guanajuato, is such as will permit the use of wall-brackets to the best advantages and therefore the above plan is entirely feasible.

WILBUR E. SANDERS.

Helena, Montana, May 2, 1906.

Hydraulic Mining by Pumping.

Written for the MINING AND SCIENTIFIC PRESS by DENNIS H. STOVALL.

Until one year ago hydraulic mining by pumping or forced power was something of an experiment. It had been tried in various mining districts without much success, the main reasons being lack of cheap natural power, inadequate pumping equipment, and deficient working ground.

It remained for the Golden Drift Mining Company, operating in the Dry Diggings district of southern

HYDRAULICKING ON ROGUE RIVER, OREGON.

Oregon, to successfully solve the problem of hydraulic mining by pumping. This company has amply demonstrated that where proper facilities exist, placer mining can be done by forced power, thus overcoming the embarrassment of long seasons of idleness through the summer months, of light rains and slack water supply for ditches and reservois.

In the property of the Golden Drift Mining Company are included 800 acres of ground locally called 'dry diggings,' because the very best seasons afford but 60 or 90 days' run for the giants. Rogue river, a wild, turbulent stream, at no time flowing less than half a million miner's inches of water, flows along the eastern border of this tract. M. C. Ament, the manager, believed that the Rogue river could be harnessed, and its power utilized for hydraulic mining. He was supported in this belief by his father, C. G. Ament, and other officials of the company. Liberal financial backing was given, and the dam was begun. It was a tremendous task, and two years were required to complete it. Over 4,000,000 ft. of lumber were used, and over 3,000,000 tons of rock were filled into the monster cribs, which were first pinned to the bedrock by 40-ft. piling. The dam has a length on the crest of 265 ft.; it is 120 ft. thick on the bed of the river, and is eight feet wide on deck. It has an 80-ft. abutment, 80 ft. wide. The penstock is 120 ft. wide, and has twelve 10-ft. gates by which the water is admitted to the turbines. During the year the plant has been operated, the tailing from the fumes has been dumped into the river above the dam, and this has made a solid rock-filling, which has practically raised the bed of the river up to the level of the deck, a level that is maintained for a quarter mile up-stream.

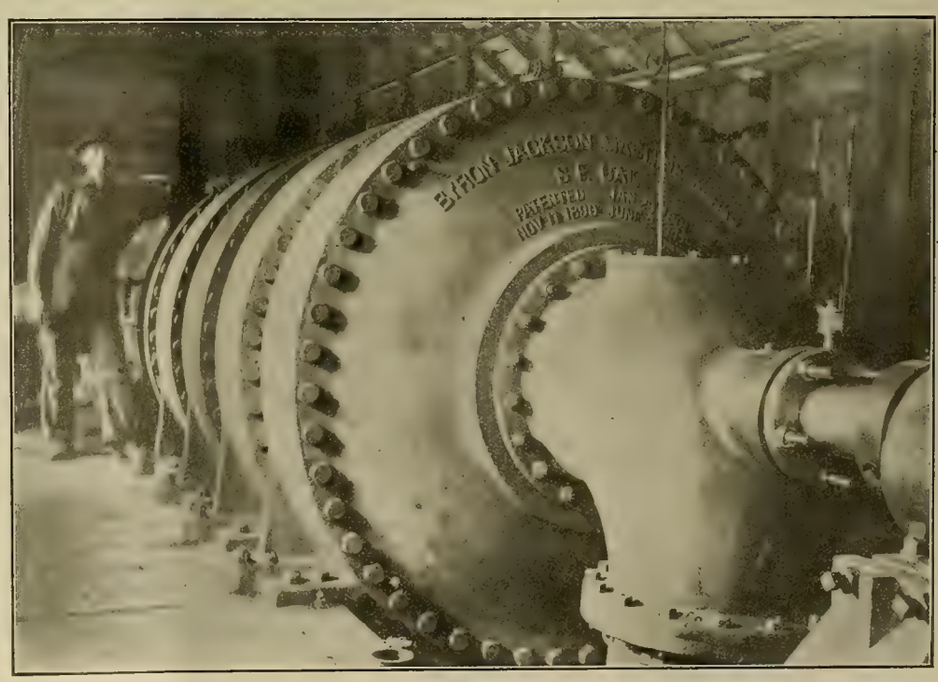
The fall of water over the crest of the dam is 20 ft., and this develops 6,000 h. p. At present, four turbines are operated, developing 1,200 h. p., all of which is delivered to the one pump. Two additional turbines are being installed, the power of which will also be delivered to the one pump, that it may operate to its full capacity. This summer ten additional wheels will be installed, and two more pumps added, by which three giants can be operated instead of two, besides affording abundant bank or by-water.

The pump, which is the heart of the plant, is of the five-step centrifugal type. It was built by the Byron Jackson Machine Works, of San Francisco, and is said to be the biggest high-head pump in the world. Its weight is 35 tons, and its tested maximum pressure is 250 lb.; the operating pressure being 185 lb. per sq. in. Its capacity is 13,000,000 gal. per 24 hr., or 9,000 gal. per min. This great volume is delivered through 1,500 feet of 22-in. steel piping, and is lifted to a height of 170 ft. before dropping into the diggings, and forking to the 11-in. giant pipes.

The highest pressure attainable with the 1,200 h. p. now developed is 145 lb. per sq. in., or 40 lb. less than the pump's normal capacity. Mr. Ament believes that the addition of the two turbines now being placed will raise the pump to its full efficiency, and give greater cutting power to the giants. The monitors have three-inch nozzles, and throw a stream 460 ft. Mining is done, however, from a distance of 100 or 150 ft. The banks are from 40 to 65 ft. high, and are easily cut by the jets. The gravel lies in strata of brown and blue, with red clay capping. The coarse gold and nuggets are found in the lower layers. The finer or average gold occurs in the pipe clays occupying the layers in the center of the banks, and the flour gold is found in the clay capping.

The system by which the pumping battery is operated is simple, the main purpose being to keep the giants always pointed to the gravel. Night and day they are operated, with only a 20-min. stop each evening to oil up. Two systems of sluices are employed, with block and strap iron riffles; while one riffle system is in use, the other is being cleaned up, thus obviating the necessity for a complete shut-down. When the big pump is closed down each evening, it releases the herculean force from behind 26,000 gal. of water, the volume required to fill the long pipe-line. To prevent the 170-ft. head from hurling this great weight of water back upon the pump, a check-valve is placed at the base of the pipe-line; and the work of starting the pump against this great volume of water is made simple by first releasing the water through a side-pipe into the race, and slowly closing it, thus switching the pump to the main line by degrees, until it attains its normal working pressure. Both the speed and the pressure of the pump are registered by gauge in the power-house.

Welding.—In the days of wrought iron, welding was the basis of all forging and of very much structural work. Today almost all structural members are made of steel, as well as a great proportion of the stock that is in the shop of the village blacksmith. This soft steel will weld and the average blacksmith and machinist, to say nothing of some engineers, who ought to know better, believe that a welded piece of steel is as good or practically as good as a new bar. While such a weld is better than nothing, and while it may have half the strength of the natural bar, and may have the full strength, it does not have the toughness, and is unfit for use in any place where failure will be dangerous, and where it can possibly be avoided. A weld of wrought iron is entirely unreliable. This is the case even where the welds are carefully made by smiths of long experience in handling steel, and with bars easily heated and quickly handled.



FIVE-STEP CENTRIFUGAL PUMP EMPLOYED BY GOLDEN DRIFT MINING CO., OREGON.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The blue rock marked J. E. R., Columbus, is a dumortierite. It has no particular value, except possibly, as cabinet specimens.

The rocks from Manhattan, Nev., are: No. 1, hydro-mica schist; No. 2, also hydro-mica schist, but finer textured; No. 3 is a silicified country rock and contains visible gold.

The small white pebbles from Columbia, Arizona, are chalcedony (quartz) and are probably amygdaloidal, having formed by infiltration of silica into air vesicles in a lava.

The gray sand from the drift mine near San Andreas, Cal., should be sent for investigation to the United States Geological Survey, in care of Dr. David T. Day, at Washington, D. C.

The rocks from Lyons Peak, San Diego county, Cal., are Norite. This is a basic rock approaching diabase in the occurrence of the minerals, among which are brown hornblende, labradorite, olivine, and oligoclase. The rock contains no quartz.

The mineral sample from Everett, Wash., marked A. W. M. is quartz, in which is disseminated pyrite. It should be assayed for both gold and silver. The presence of these metals, unless they can be seen, is not in our province to determine.

The rocks from Cerbat, Arizona, have been classified as follows: No. 1, Granite, in which is developed a semi-gneissoid structure. The minerals present are quartz, orthoclase, hornblende and muscovite; No. 2, Quartzite, containing a little copper-iron sulphide; No. 3, semi-crystalline limestone; No. 4, consists almost wholly of hornblende, though biotite, quartz and a little feldspar are also present. It may properly be called Quartz-Mica-Diorite; No. 5 is kaolinized feldspathic dike rock; No. 6, a basic dike rock, too much altered by infiltration of foreign minerals and subsequent oxidation to make determination possible; No. 7, Aplite, fine-grained micaless granite.

Sample No. 1 from Placerville, Idaho, marked A. C. G., is feldspar-porphyry. It is much altered. No. 2 is an altered eruptive rock, probably a greenstone, containing much pyrite. No. 3 is similar to No. 2, but contains more pyrite. No. 4 is evidently a portion of the same rock as No. 2, though containing more silica (quartz) and more iron sulphide (pyrite) than any of the others. Nos. 2, 3 and 4 should be assayed for precious metals, particularly No. 4.

Vein Mining in Alaska.

Written for the MINING AND SCIENTIFIC PRESS by CHESTER W. PURINGTON.

From a territory comprised within two square miles on Douglas Island, Alaska, a sum in excess of eight millions of dollars has been won in dividends from the mining of gold quartz. Although Alaska is an area of nearly 600,000 square miles, or four times the size of California, no other portion of its immense area has yet afforded a vein mine producing metal which has paid any dividends, as far as known. Considering the time which has elapsed since 1885, when the Treadwell group began producing heavily, the fact just noted is remarkable.

Alaska should be considered in three separate provinces: 1. The South Coast province, including the strip of land extending north and west from the southern boundary to Mount St. Elias, the Alexander Archipelago, and farther to the west, the land to the south of the St. Elias, Chugach, and Alaska ranges, the Kenai, and Alaska peninsulas, Kodiak island the Shumagins, and the Aleutian islands. This is the most important province from the standpoint of metalliferous veins. 2. The Bering Sea province, comprising the coastal region to the north of Alaska peninsula, bordering on Bristol bay, and Norton sound, and the Nome or Seward Peninsula region. 3. The Interior province includes all the country to the north of the St. Elias and Alaska ranges, the drainage of the Tanana, Yukon, Kuskokwim, and Koyukuk rivers, to the Arctic coast.

1. In the Alexander Archipelago portion of this province, conditions for quartz mining are fairly good, as for example transportation facilities, labor, water, abundance of timber, and the fact that there are no important producing mines on Prince of Wales, Kupreanof, Admiralty, Chichagof, and Baranof islands or on the adjacent Alaskan mainland, leads one to believe one of two things, either that the country has not been sufficiently prospected, or that those veins which have been opened up have proved too poor to work. As a matter of fact there has been a considerable amount of prospecting. The region directly about Juneau, in Silver Bow and Sheep Creek basins has produced some gold and silver from belts of stringers in the schistose rocks which there prevail. The operations are small, however, and I have never seen a published statement of the results. There have been some costly mining experiments on Baranof island. In Lat. 55° north, near the British Columbia border, there has been active prospecting on the islands and mainland since 1897. Veins carrying gold with large relative proportion of copper have been uncovered, but the product either of gold or copper has been unimportant hitherto. It must be admitted that there are large areas unprospected in the Alexander archipelago, as the whole region is covered with a formidable vegetable mat, rendering access to the interior of the islands nearly impossible, while outcrops are exposed only on the shores and in creek beds.

In the Lake Atlin district of British Columbia, prospecting has been in progress on Windy Arm, and extravagant reports have come out of bodies of high-grade silver ore enccuntered on the surface. It matters little whether these reports are correct or not, so far as Alaska is concerned, as the veins are not likely to have their extension in American territory.

In the most westerly portion of the South Coast province there are undoubtedly bodies of copper ore of considerable size in the vicinity of Mt. Wrangel (Lat. 62° north), and in the Copper River drainage. Every year come the same marvelous reports, the same squabbles over locations, yet no machinery goes into the famous copper districts, and no copper comes out except in the form of specimens. One does not hear even that the claims have been patented. In some of the islands of Prince William sound, deposits of chalcopyrite are being prospected, and some shipments are being made. It is probably safe to estimate that 100,000 lb. copper per month are being produced, the bulk of the ore being smelted at Tacoma. Here again the islands are not thoroughly prospected, and it is not impossible that important orebodies may yet be uncovered.

On the Kenai peninsula prospecting has resulted in the finding of small quartz veins, which occasionally exhibit free gold. The veins are mostly narrow, and I do not remember to have seen any exceeding eighteen inches in width.

Coming to the western portion of the South Coast province, the region to the west and southwest of Cook Inlet is fairly promising. The geological conditions in the region intersected by the Yentna river and its tributaries are such that one may reasonably look for workable gold veins. There are said to be promising copper leads at the head of the Sushitna river.

The volcanic range forming much of the Alaska peninsula, the Shumagin islands, and the Aleutians may contain payable gold deposits. It is on record that the Apollo mine on Unga island has produced over $700,000 and a statement of its financial results would be interesting, but as far as I know none has been published. The deposit is a reticulated vein in a country of fresh dacite. It is situated in a region of extremely recent volcanic rocks, and it is not unlikely that the Apollo represents the most recently formed gold deposit known. Very little prospecting for similar deposits has been prosecuted among the Aleutians and on the adjacent Alaska mainland. It would not be surprising if workable orebodies of limited size, occur.

2. There is one quartz mine producing gold in the Solomon River district of the Seward peninsula. The enterprise is small, but I believe financially successful. The publication of data concerning its production and the cost of that production would be extremely useful, as it is the sole representative of quartz-mining industry in an isolated section. There is much prospecting for gold-bearing quartz in the Seward peninsula, which may eventually result in the establishment of productive mines.

The tin-bearing veins of Cape York afford some promise of future production. Up to the present, the industry is entirely in the prospective stage. Conditions for mining are extremely difficult at Cape York.

As for the rest of the Bering Sea province, including the whole coast-line south from Norton bay to Bristol bay, there are no data for forming an opinion of its mining possibilities. A large portion of the area consists of tundra-covered flats in which outcrops do not occur; the chances are that it will always remain a great non-productive waste.

3. In the Interior province of Alaska there is no quartz mine which is producing gold, silver, copper or any other metal. Reports of copper deposits at the head of the Tanana and White rivers continue to be circulated. However rich they may be, they are without value in the present stage of Alaska development.

The placer mining districts of Fairbanks, Birch Creek, Forty-mile, as well as the Klondike district of the Yukon Territory, derive their gold from stringers in the slate and schist, and the development of any profitable mines seems not even a possibility in those districts. In the course of a trip of 250 miles from Circle to Fairbanks, where good opportunity was afforded for seeing the rocks, I observed only one quartz vein exceeding six inches in width. I believe that when the tributaries of the Kuskokwim, which head in the McKinley range, have been more thoroughly explored, gold-quartz veins of considerable value will be found.

That part of Interior Alaska which lies to the north of the Yukon river may be practically eliminated from consideration so far as the future of vein mining is concerned, as no deposit except one of extraordinary richness could be worked under the extremely rigorous climatic conditions which obtain there.

Core Drilling.—One of the ways in which diamond core drills are now being extensively used, is in testing foundations for tall buildings, dams and other structures which have to be erected on solid rock in order that their foundations may withstand enormous weights and strains. The American Diamond Rock Drill Company is now engaged on a contract to determine the nature of the foundation rock for the proposed new dam in the Croton watershed, in New York. The core drill being used for this work is adapted to drilling from 650 to 800 ft., but on a recent test it succeeded in attaining a depth of over 1000 ft. The ground was exceedingly rough, and the holes had to be drilled in a steep side hill and through materials varying from sand to heavy boulders and rock of every degree of hardness, making the work exceedingly difficult to perform. The drill was a No. 8 Marline, mounted in Style B, with boilers and pumps complete. It is designed to take out a 1¼in. core and will bore at any angle. It weighs 675 lb. set up and required eight horse-power to operate it.

In forging rock-drill bits those for medium hard rock should have sharp chisel bits. As the hardness of the rock increases, the angle of the bit may be made more blunt, and the cutting edge shaped from a straight line to a curve, to prevent the corners being chipped off.

The United States Steel Corporation will carry on explorations for iron ore in the Adirondacks this summer.

Methods of Hand-Drilling.

Written for the MINING AND SCIENTIFIC PRESS by W. R. HULBERT.

It often happens in prospecting that considerable rock has to be excavated in order to determine the value of a mining property; and, as a general rule, prospectors have to work out of the range of mechanical conveniences. It therefore becomes necessary to choose some method of drilling which will be effective and fast but at the same time free from cumbersome machinery. Aside from this, however, there are numerous other cases where the amount of rock to be excavated is so small that it would not warrant the expense of installing boilers, air compressors or dynamos for the operation of the various systems of power-drilling which are now on the market. The question then arises as to which method of hand-drilling shall be adopted; that being the only system which requires no auxiliary apparatus.

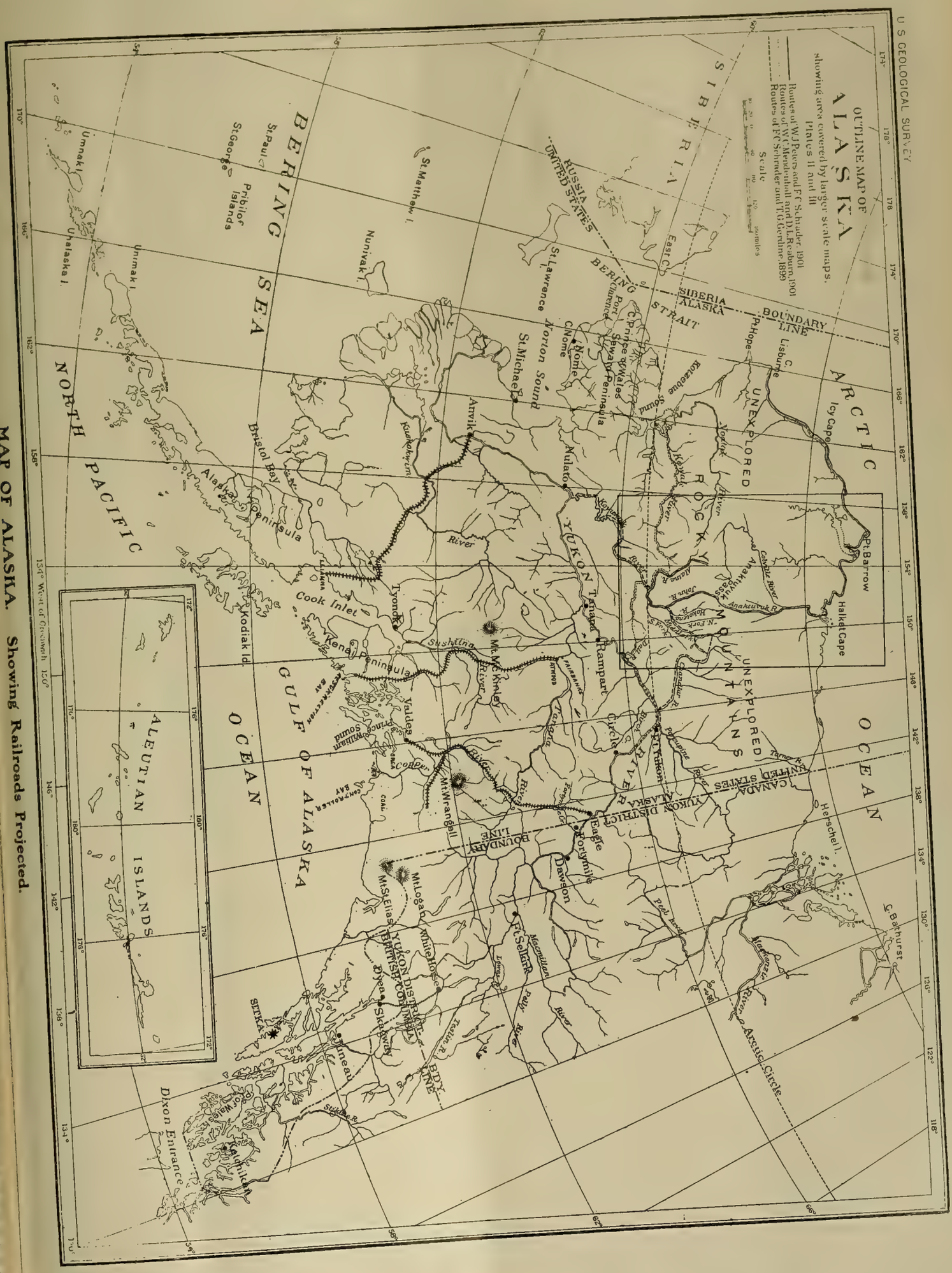
It is not the intention of this article to go into the cost of rock excavation by the different systems of hand-drilling, that subject having been thoroughly treated by the different works on rock excavation by Gillette, Prelini, etc. It is rather my object to discuss the various systems impartially in order that the reader may gain an idea of their relative merits. This is really the only fair way to discuss the subject, since the muscular force of men and animals varies with race, species, size, health, training, temperament and muscular endowment of the individual.

Another factor of importance which must be considered in this connection is that large powers can only be obtained by the aggregation of many units, and a limit is set by the endurance of the individual. In order therefore that a maximum effect may be obtained, it is necessary to devise or adopt a system of drilling which will permit of a uniform expenditure of effort throughout the working day.

There are three systems of hand-drilling now in general use; the first, of course, being the old-fashioned hammer and bit method which is still the system most frequently seen and which is probably the best for drilling short holes and for plug and feather work, since it can be used successfully by any class of labor, no matter how ignorant. Furthermore the tools are simple, easily procured and easily transported. With this system it has been found to be more economical to let one man do all the drilling, instead of having one man hold the bit while one, or perhaps two or three others, do the striking with sledge hammers. Two other methods of hand-drilling have been devised, the first of which is known as the 'churn' and is similar in every way to the systems now being used for drilling artesian wells, a heavy bit being raised by hand and allowed to fall, thus cutting its way through the rock. This system has certain advantages, in that the force of the blow is not absorbed in the bit, but it also has grave disadvantages due to the fact that it is practically limited to the drilling of vertical holes and requires skill. Another objection is the trouble experienced in starting holes with this kind of an apparatus. It will be seen therefore that churn-drilling does not solve the problem entirely, and a great deal of time and thought has been expended in order that a hand-operated drilling machine might be produced that would work equally well for either short or deep holes, and that would operate either vertically or horizontally.

It is a well recognized fact that a man can do a great deal more work by turning a crank than by operating a hammer. Rankine gives the daily work developed by a man hammering as 480,000 foot pounds, and in turning a crank 1,296,000 foot pounds, being in the ratio of 1 to 2.7; and while the conditions of the work with the revolving crank are probably less favorable than with a winch under practically steady load, (the case considered by Rankine), the fact remains that the turning of a crank, with resistances fairly balanced by a fly-wheel, is a better way of utilizing a man's strength than by the consecutive lifting and dropping of a hammer.

Acting on these facts, several manufacturers went into the production of hand rock-drills which could be operated by turning a crank. Unfortunately, however, most of them made the great mistake of trying to produce a drill which would compete with power-drills in regard to rapidity of drilling; the result being that it required so much effort to operate these drills that the men were soon exhausted and the drill was cast aside as worthless. A few manufacturers, however, contented themselves with manufacturing a drill that would compete successfully with other methods of hand-drilling and these drills have been successful. The interior mechanism of the drill consists of but two moving parts, a ram with collars, made in a solid steel forging, and a shaft carrying two cams. The ram is pushed back by means



MAP OF ALASKA. Showing Railroads Projected.

of the cams and, upon the latter releasing, is thrown forward by the action of a heavy spring. The whole, of course, is operated by the turning of a crank which is so geared to the cam-shaft that the drill will strike an average of 3¼ blows for each revolution of the crank. This apparatus is easily handled and yet it is claimed that it will do twice as much work as a man will with hammer and bit, working in the same ground and under like conditions.

One of the principal advantages of these hand-drilling machines is the fact that they can be mounted on a light tripod or column in the same manner as a power-drill, and can therefore be used to better advantage for tunneling, stoping, drifting, etc., the support being rigid enough for the purpose intended yet light enough to permit of easy handling. On this account, and because of their effectiveness and simplicity, it would seem as though there ought to be a large field for this class of machinery.

Personal.

Ross B. Hoffman has gone to Montana.

T. H. Proske, of Denver, Colo., is at Joplin, Missouri.

George S. Binckley has returned to Monterey, Mexico.

Frank C. Loring is examining mines at Cobalt, in Ontario.

Robert Delarge has returned to Berkeley from Prescott, Ariz.

Louis Noble, of Denver, is examining mines in British Columbia.

Arthur L. Walker has returned to San Francisco from New York.

Stephen A. Ionides sailed from New York for London on April 25.

John Eudey has returned to Jackson, Cal. from Sonora, Mexico.

Harold Rickard was in New York on April 20 on his way to England.

Robert J. Frecheville sailed from San Francisco for Japan on May 10.

Blamey Stevens is examining mines in Tuolumne county, California.

R. Gilman Brown is examining mines in Tuolumne county, California.

G. B. Manson is superintendent of the Rincon Mines Co., at Martinez, Ariz.

W. Murdoch Wiley expected to sail from Vera Cruz for New York on May 10.

Walter H. Weed has returned to New York from Cananea, in Sonora, Mexico.

M. W. Hoyle, manager of the Gold Dust Mining Co., Breckenridge, Colo., is in Chicago.

Alexander Burrell has left Berkeley, returning to Helena, Mont., where he formerly lived.

J. H. Mackenzie has abandoned his contemplated expedition to Alaska for the present.

A. H. Keller is engaged in metallurgical work at Santa Rosa de Copan, in Honduras.

Frederick B. Reece, having graduated from the University of California, has gone to Utah.

A. F. Hewitt, of Hewitt, Carstraphen & Co., Denver, Colo., is in Arizona on professional business.

Harold A. Titcomb has returned from Central America and is now on a visit to New Orleans.

Frederick Grundy has returned to Los Angeles from a professional trip to the Cerbat district, Arizona.

Ellsworth Daggett, of Salt Lake City, is manager of the Nevada Co., with mines at Austin, Nevada.

W. W. Wishon was burnt out by the fire; he has taken his family from San Francisco to Los Angeles.

John J. Daly was at San Francisco during the conflagration; he has returned safely to Park City, Utah.

George W. Gilmore, treasurer of the Mohawk Mines Co., Denver, is at the mine near La Plata City, Colorado.

H. R. Plate, of Denver, has gone to Ely, having been appointed manager for the Nevada United Mining Company.

E. D. McDermott, who lately has been in Arizona and Colorado, sailed on the 'Nippon Maru' for Japan, as assistant to R. J. Frecheville.

J. Langeloth, president of the American Metal Co., Ltd., New York, passed through San Francisco on his way from Cananea to Granby, B. C.

At the annual meeting and dinner of the Pittsburg Lehigh Club, on the evening of April 21, Charles L. Taylor, who is allied with the Carnegie interests and who is a trustee of Lehigh, announced a gift from Andrew Carnegie of $100,000, to be applied to the erection of dormitories at Lehigh University. This is the first large sum that has ever come to Lehigh from other than alumni of the university of the men identified with its founding.

Obituary.

Henry Williams Parkhurst, past president Western Society of Engineers, Member of American Society of Civil Engineers, died April 7th from injuries sustained on Feb. 20, 1906, in Chicago. He was born at Boston, Mass., June 25, 1847.

Samuel Williams, of El Paso, was killed by Yaqui Indians in Sonora, Mexico, on April 15. A telegram from Hermosillo states that the party, with which Williams was traveling, was ambushed; he was assayer with the Giroux Consolidated Mining Co., at Carbo, Sonora.

George Lansell died at Bendigo, Victoria, on March 18. He was the best known mine-owner in Australia and one of the most enterprising citizens of that Commonwealth. As the owner of the 180 mine, for many years the deepest gold mine in the world, he won a deserved celebrity, for he was the pioneer of deep sinking at Bendigo. Thirty years ago, when wild speculation had brought its usual reaction and when the shallow mines had penetrated below the rich outcrops, Lansell asserted his confidence—and intelligence—by sinking the 180 mine until between 1,560 and 1,870 ft. he penetrated the great saddle reef which made him a rich man. He continued to take a keen interest in mining operations and enlarged the scope of them until he was the largest mine-owner in Australasia. The 180 mine is now yielding profitable ore at 3,310 ft. below the surface. Beyond his success as a speculator, he was a public-spirited citizen and did more than his share to build up and to beautify Bendigo. At Fortuna he had a lovely home, the gardens of which were made on the old tailing heaps from his stamp-mill, and there he entertained travelers from every part of the world. The house, with its statuary and fine paintings, was alongside the stable and that in turn came next to a 32-stamp mill, the noise of which, to the old miner, was a music only unpleasant when it stopped. He died at an advanced age, for he was over eighty, after a life of great usefulness.

Horace F. Brown, mining engineer and inventor, died suddenly of heart failure on April 15, in Chicago. He was born at Litchfield, Michigan, in 1840, and for more than forty years was actively engaged in mining, and particularly in devising means and ways to constantly improve the prevailing methods. The mining industry has benefited much by the products of his fertile brain. Being honest and honorable in all his dealings, competent to an unusual degree, and an indefatigable worker, he attained a high position in the field of mining and metallurgy. His first work after leaving school was mining in Plumas county, California, in 1862. This led to surveying and other engineering work of like character. It was his good fortune to be associated with a man named Maloy, who was a genius in the way of devising ways and means for doing work under difficulties. As a large part of his life was spent on the frontier, remote from modern facilities for doing engineering work, the training he got from Maloy was invaluable to him. From Plumas county he went to the Reese River district in Nevada, and erected a silver mill for a company from Butte county, California. The mill was a counterpart of those then in use on the Comstock lode at Virginia City, but the Reese River ores were of a totally different nature, so the mill was a failure, and it became necessary to change it to a chloridizing mill. For this purpose hand-rabbled furnaces were erected, and all of the ore was roasted with salt to change the silver to chloride. This was his first experience in complex methods. From Reese River he went to Virginia City, and had a varied experience in silver milling and mining in deep mines. During 1864 he worked in some of the mills of Carson Valley and gained some experience in the erection of special appliances for the recovery of silver. At that time the art was little understood, so that his work was a constant succession of experiments, both as to mechanical appliances and as to chemistry. After some experience in the lead smelting camps of Nevada, he returned East and spent some time in coal mining in Pennsylvania, Indiana and Illinois, in trying to introduce a machine he had patented, which was the first built in the United States of the continuous-cutting type. This device was successful, but he was unfortunate in being a pioneer as there was at that time a strong prejudice, not only among the miners, but among the mine bosses and superintendents as well, against the introduction of machinery for this purpose. He had, however, the melancholy satisfaction of seeing all of the continuous coal-cutting machines now in use built upon the identical line covering his patent, but his patent expired before this type of machinery came into general use, so he never reaped any reward, except some valuable experience. When in Pennsylvania, at the Fall Brook coal mines, he put in the first underground wire-rope haulage system in the State, and met with the same resistance among the miners that he had encountered in trying to introduce the coal-mining machinery. After being badly injured in the mines and having exhausted his resources, he went to Montana and took up metal mining and ore reduction. He was two and a half years with the Hecla Consolidated Mining Co., in Beaverhead county, Montana. These were nominally lead mines, but there was so much copper that both metals had to be reckoned with. At this plant the principal product was lead bullion, but as the ore contained a good deal of copper, quite a large proportion of the metal recovered was in the form of a lead-copper matte. This he was obliged to re-smelt for the purpose of eliminating its lead content, and, in a measure, the silver, and for enriching the copper content. All of the product was marketed in Germany, as no refineries would handle such material in America at that time. On arrival at Hecla he found small primitive smelting furnaces, but he had the satisfaction before leaving of devising and installing some large water-jacket furnaces, the iron work of which was built by Fraser & Chalmers, and which is still their standard for such plants. During his stay with the Hecla company he had charge of all the mechanical work, both at the smelter and mine. Owing to the success of this plant, others desired to copy the machinery, and he left there with the purpose of installing similar works at other points, and was for two and one-half years superintendent of the Alta-Montana Company's plant near Helena, Montana. This property consisted of five mines, one wet concentrator for lead ores, one dry concentrator for lead-silver ores, one 20-stamp free-gold mill, one 15-stamp chloridizing mill, and a 50-ton lead-silver smelter. He made the designs and superintended the erection of this entire plant except the free-gold mill. At this plant he did all the metallurgical work and was directly in charge of the mining development, and in general charge of the concentrators and the free-gold mill, these last two being several miles from the main works. As this was before the days of railroads when all of the salt had to be hauled from Salt Lake City by wagon and all of the bullion sent to Corinne by the same method, one can readily imagine that his duties were varied, and he was obliged to make-shift often to keep the plant running. He finally became so impregnated with lead and arsenical poison that he was forced to leave the smelters and engage in the manufacture and erection of mining machinery, the designing and erection of metallurgical plants, and supervision as consulting engineer of mines. He organized the Western Iron Works corporation of Butte, Montana, and was manager of that plant. While at the Alta-Montana Company's plant, he had become thoroughly impressed with the wasteful and expensive character of the prevailing practice of ore roasting, and busied himself with devising means for bettering the operation. This finally resulted in the patenting of what had been known as the Brown roasting furnace, which revolutionized the practice of ore roasting in reverberatory furnaces. He met the usual fate of successful inventors, and was obliged to go to law to protect himself against infringers of his device. For six years he was engaged in persistent law suits, but he finally prevailed against all of the infringing devices. While he was successful, he found that there was but little left after settling multitudinous claims of lawyers, witnesses and other expenses.

Among other metallurgical devices which he originated was a condensing chamber for the recovery of volatile fume from lead-smelting plants. This device was erected at Omaha, Neb., by the Omaha and Grant Smelting Company. In addition to successful inventions set forth in the above, he designed and built a continuous-working kiln for making carbonic acid gas direct from lime-rock by heat instead of by the use of acids and marble dust. This device was successful and was installed in several cities. With the growth of concentration and the constantly increasing fineness of the material to be treated, the question of the after treatment of the fine concentrate became a serious one. His work in this direction was successful and resulted in patenting what he termed the Brown Down-Draft Smelting Process; a process designed to handle fine materials, such as dust from blast furnaces, iron sand and fine concentrate.

His life was a useful one, his heart a generous one, and to know him was to admire and love him. The mining industry has suffered the loss of one of its most intelligent workers.

Standardization of Mine Accounts.

Written for the MINING AND SCIENTIFIC PRESS by
H. G. NICHOLS.

Although the subject of mine accounts has been much discussed, there is still room, it would appear, for definite conclusions relating to certain important aspects.

Various opinions have been expressed concerning the possibilities of standardizing, in a greater or less measure, a scheme of accounts, and the general decision arrived at would seem to be, that while such a system would be most desirable, the difficulties of correlating the several works of different undertakings, are enough to render more than a general outline or skeleton scheme, such as is capable of modification and expansion to meet the diverse needs, well nigh impossible.

I, for one, would be glad to see this discussion reopened with a view to seeing if it might not be possible to achieve something more in a matter so desirable from the standpoint of technical and financial requirements individually—and for the gain to be derived by more closely defining the relations between these two factors of a mining undertaking.

The last point would be secured by every step that reduces vagueness in, and gives the definite market value to, technical statements. No mine is worked, or is supposed to be, by reason of its technical interest. It is the duty of the engineer to state operations and possibilities according to his judgment, in understandable terms. No opinion is of value which is not based, wherever possible, upon actual figures, and no figures are of value unless complete. Hence the necessity of arranging figures in such a way to represent facts as they ought to be stated and understood in the direction of the operations.

The following notes are submitted in the hope that they may serve to induce some further discussion upon the subject, and, as the outline of a scheme for the standardization of all mine accounts. The aim should be the elimination, ultimately, of all general or indefinite items and the reduction of all the expenses incurred to accounts of a self-explanatory denomination.

Speaking generally, it is necessary to collect all expenses having relation to the several departments, under certain headings and in such a form as to facilitate calculation of cost per unit of the most essential factors; also, to keep distinct, all items bearing on one department; and to include all apportionments of general or special expense in each department.

The system of accounts kept by each milling company at their works, must provide for all expenses being finally gathered together and referred to such explanatory accounts. Further, it is very necessary that a financial scheme should be universally adopted whereby the value of all works and improvements is recognized as being dependent upon, and for the benefit of the operations during a period of time regulated by the conditions existing and which were held to justify the undertaking of such operations at their inception. To use Mr. H. C. Hoover's words "the clothing of dead mines" should be assessed at its proper value—which may be nothing.

To enumerate the points which appear in the scheme:

(1) As stated above, it is necessary to have a set of primary accounts of which there shall be one for each step in the actual operations of ore-getting and treatment.

(2) In-as-much as there must always be individually characteristic works in connection with every property, the ultimate aim of which may be apparent only to those conducting the operations, each individual undertaking must have a set of secondary or department accounts (suitable to its own requirements) of which there must be one for each branch or department, carried on for the benefit of, or common to, possibly more than one primary account; these are to be distributed monthly to, and between, such primary accounts.

(3) There must be accounts which may be called 'special' or 'periodical', dealing with expenses incurred for the benefit of any part of, or all, of the operations that are essentially distributable in point of time benefited, and that are subject to subdivision, to be hereinafter outlined.

To enumerate one more generalization before proceeding to special points which must be provided for, it may be stated that the objects of mining accounts are:

(1) To afford a guide in the laying out of future work.

(2) To afford a means of supplying the home office with such details of work as may enable them to compare results with anticipations, and to shape their financial policy.

The principal requirement in achieving the first is detail, in the second, simplicity.

It is not necessary to enlarge upon the part played by fixed charges in the formulation of schemes for mining work, but as to what constitutes a fixed charge and as to the best way of efficiently segregating it without confusing the accounts, and yet so as to emphasize their individuality—these are points worthy of discussion. The decision as to which accounts must be considered as embodying expenses, the incurring of which is independent of the tonnage—and if not wholly so, then, to what extent—must always remain more or less a matter of judgment, and to be decided only from an intimate knowledge of the conditions. It is not sufficient only to class such outside expenses as those in connection with the running of the office, traveling, administration or legal expenses, etc., as fixed charges, for, it is apparent that there are many items other than these upon which the cost per ton for varying tonnages will not vary in the same proportion. So important is the bearing of these fixed charges on the principles of mining finance that none of such items can be disregarded.

It may be taken as an axiom that all expenses are incurred in order to benefit the working of the property, that the life of a mine is a calculable quantity and that no useless expenses are allowed; therefore, all expenses are ultimately referable to the working accounts in proportion, or in relation, to the time benefited; all regular working expenses are periodically posted to the Primary and Secondary accounts; for the rest, special accounts are divisible into:

(1) Those involving expenditure necessary for the immediate operations, but which still at the same time benefit future periods. These will be called 'Concurrent' accounts:

(2) Those involving expenditure upon works for future operations and having no bearing on existing procedure. These will be termed 'Anticipatory' accounts.

The first class, being necessary to the operations, are operating expenses, but they are not actually wholly chargeable to the month in which they are incurred, and are referable to a Floating General Account, for apportionment without interest.

The second, being by nature Anticipatory, as regard the benefits conferred are, so far as present operations are concerned, paid with borrowed money, and are referable to an Amortization Account. The following table of accounts is suggested as supplying the requirements of financial and technical management.

A. PRIMARY ACCOUNTS.

(1) **Mine Stoping.** Breaking rock in established stopes, and delivering same through shaft or tunnel, to the surface, including the expense of sorting and handling of waste encountered in the stope.

(2) **Mine Stoping Development.** Preparation for stoping an established orebody. Provisions for ventilation in working the stope, and for handling the broken ore.

(3) **Mine Development.** Prospecting, and all work having for its object the establishment of orebodies (the creation of reserves) including all the equipments necessary to the proper operation of such work to that end.

(4) **Mine Hoisting.** Work performed by means of the main hoisting works, in completed shafts or sections of shafts.

(5) **Mine Foremen.** Supervision of mining operations, including salaries of foreman and all officials directly under his orders, such as, time-keeper, storekeeper, shift-bosses, etc.

(6) **Mine Expense.** Repairs and maintenance necessary for keeping existing works open, and maintaining the efficiency of all underground and surface works.

(7) **Ore Transportation.** Delivery of the ore to be treated from the mine depository to that point where the first step in its treatment, or for the benefit of its treatment, is taken.

(8) **Milling.** Handling and treatment of the ore from the time that it is delivered, to the point where it leaves the mill in form of tailing not capable of economic amalgamation or concentration, and including the production, ready for delivery, of amalgam and concentrate; attention to driven mill machinery, and regular wear and tear. (In the mill cost-sheet, this account is divided into 'amalgamation,' 'labor and supplies,' and 'concentration;' concentration dealing only with the work on the concentrator floor.)

(9) **Concentrate.** The removal and subsequent expense incurred in the reduction of concentrate. (By making a separate account for this product, the various conditions that may obtain regarding the treatment of it, are included under one heading, whether it is shipped, smelted, or treated at the works in any other way. There is, of course, a credit as well as a debit side to this account.

(10) **Mill Bullion Product.** The account for returns from amalgamation.

(11) **Tailing Transportation.** All expenses connected with the handling of tailing, from the time that it leaves the mill, until the time that it is received in the tailing treatment plant, or, where no such plant exists, runs to waste.

(12) **Tailing Treatment.** All or any treatment of tailing after it is discharged from the mill.

(13) **Bullion Charges.** The cost of shipment to purchaser, and of sales of all bullion.

In gold mining, the above is suggested as being the scope of the Primary Accounts, and is intended to include every radical step in the undertaking. To these accounts all expenses are ultimately to be referred, whether charged direct, or through the medium of:

B. SECONDARY ACCOUNTS.

(1) **Power.** Carpenters, blacksmiths, fitters or mechanics' shop expenses. Nearly all work done can be charged direct to the Primary Accounts, but the running of shop machinery, and up-keep of tools and the salaries of outside foreman and his officials, if any, should be included in this account.

(2) **Assay Office.** Where retorting and smelting is included in the department of the assayer, a value for each of these operations should be assigned in assay units, and the total expense of the department be distributed between the mine, mill and tailing plants in proportion to the assay units of work done for each.

(3) **Office Expense.** Clerical work. It may be extended to include some work in connection with the store-house.

(4) **Administration Expense.** Technical supervision of the works generally. Surveying is considered to be for the benefit of Administration, and is accordingly held to be chargeable to that account.

(5) **Traveling Expense.**

(6) **Legal Expense.**

C. SPECIAL ACCOUNTS.

(1) **Concurrent.** Taxes, repairs and improvements to running plant (store-house).

(2) **Anticipatory.** Secondary construction new improvements, mine equipment.

D. FLOATING GENERAL ACCOUNT.

Debited with monthly payments of No. 1 and credited with monthly appropriations of each, distributed.

E. AMORTIZATION ACCOUNT.

Debited with monthly payments of No. 2, to which is added interest at a rate to be decided upon and agreeing with that taken into account in formulating the general scheme of which such works are the result, and in pursuance of. This account is credited ultimately by appropriation of increments of profit arising from the new works.

The Question of Development. It will be seen that no Development Redemption account is included in the scheme; on the other hand however there are Development and Mine Equipment Accounts.

The theory followed is that development work is carried out according to a previously arranged programme which calls for a certain reserve. This is the case even where the principal of maximum development is followed, for the reason that whatever the rate of progress, secondary equipment will follow on its heels at proportionate rates; consequently, if development is held to be restricted as defined above, then such work ranks with the other regular operating expenses and may be considered to be in relation to the tonnage.

Other work which may be done for facilitating the working of such reserves after their existence has been established, is, from the standpoint taken, not strictly development, and therefore, a Mine Equipment account is provided for the sinking of shafts through country, to meet, or for the benefit of, established works, the enlarging and secondary equipment of all shafts, the driving of adit tunnels, not having for their object the increase of the reserve body and all such work. This account ranks quite properly with others for the construction of secondary plant, or in other words, 'Anticipatory' account and is referable to the Amortization account in common with them.

It may here be noted that the Amortization account is not distributed among the monthly charges, but is considered in toto as capital expenditure, subject to interest and redemption or amortization out of the profits secured.

Storehouse—It is preferable to consider this account in the light of a parallel or concurrent commercial undertaking run for the benefit of the mining operations.

MINE DETAIL SHEET Month of

DATE	STOPING				MAIN SHAFT				LEV. 6 South Drift						
	Miners	Muckers	Timbermen	Explosives	Miners	Muckers	Timbermen	Explosives	Miners	Muckers	Timbermen	Explosives			
	$4.00 $3.00 $2.50	$2.50 $2.00	$4.00 $2.75	P. F. C.	$4.00 $3.50	$3.00 $2.50	$5.00 $4.00	P. F. C.	$4.00 $2.50	$2.50 $2.00	$4.00 $2.75	P. F. C.			
1															
2															

Fixed Charges—From their nature it is impossible to actually state what these may be beforehand, but the accounts from which they may spring and the cause affecting their occurrence, cannot be too thoroughly understood.

Taking the accounts in the order in which they are stated, items not wholly dependent in their extent upon tonnage, or in other words not varying in the same ratio, may first be found in No. 4 or Hoisting. Both in the cost of labor and supplies, it is apparent that a larger tonnage can be handled under ordinary conditions at a lower rate than can a smaller one. Just what this difference of cost would amount to, might in many instances be stated very closely; but in the majority of instances it must be left to the judgment of those intimately connected with the conditions.

In the next account, Mine Foreman, the saving can almost be definitely assured, it being a comparatively easy matter to forecast just what increase, if any, in the department's staff will be required to cope with the enlarged works.

No. 8, Milling, affords another difficult example; for instance, to assume the case of a stamp-mill having 20 stamps for the operation of which the cost per ton is $1.20. This may be made up of:

Labor, free milling	$0.36	
Mill supplies	0.12	
Power labor	0.20	
Power supplies	0.40	
Concentrate	0.12	$1.20

Here, cost per ton of mill supplies would be subject to no change in the secondary plant of say twice the capacity, the concentrating labor might possibly be affected to a higher degree than milling labor, and the power labor most of all. It is necessary then to distinguish between these items and state them in such a way as to render the calculation of that proportion of them referable to Fixed Charges, as easy as possible.

Coming now to the Secondary accounts, the question of power is one requiring careful handling. For instance, with a small plant requiring 100 h.p. for its operation, the boiler capacity will be on a scale such that a variation of the tonnage requiring a diminution in horsepower of 30% would entail an uneconomic state of things at the boiler, far out of proportion to that brought about by the reduction by a similar tonnage in an increased plant having an output requiring a boiler capacity of say 500 h.p. Generally, it may be stated that the larger the plant, or the smaller the factor of increase, the less need is there for considering power in this respect or to any extent as a fixed charge, but other factors, as, for instance, care and repairs of ditches or flumes must always be so considered.

All the rest of the secondary accounts enumerated, come naturally in toto under the heading of Fixed Charges, and generally it may be stated that that proportion of any cost per ton in connection with any branch whatever of the works which is in excess of what the cost would be, under the conditions of the next secondary equipment, should be included as a factor in estimating Fixed Charges. Thus the decision of this matter is thrown very much upon the judgment of the engineer, and this fact emphasizes the necessity of clearly defining the channels through which all expenses must pass, and lends prominence to the details in practice for making the initial charges, while it does not detract from the advantages secured by the ultimate simplicity of the Primary accounts.

The work at the mine should be so laid out, and the accounts so arranged as to facilitate the segregation of expenses at the earliest possible moment. This means having a responsible head to each department, capable of superintending and checking (from his personal knowledge) the daily apportionments of labor and supplies. The business of time-keeping is thus twofold, being first the registration of the work performed by each man and the total number of shifts worked by all of the employees daily, which must check against the daily segregation or apportionment of the whole cost between the several accounts. This is not difficult of achievement, and with as many as 300 men on a payroll properly kept, entails perhaps half-an-hour's work for the foreman every day. On the regular payroll, in so far as possible, labor for similar work at similar rates should have space to itself. There is small objection to one name appearing in more than one place. Time-books should be large enough to allow of one or more distinctive letters or symbols, referring to accounts, being marked against each shift or fraction of a shift. A form of mine detail sheet to be kept by the foreman is given at the top of this page.

From such a sheet a superintendent is readily able to post the analysed costs in connection with each working place, as required, in his cost minute-book, which is also used for recording the work performed; and this constitutes a useful detailed record of the work. The detailed checking of supplies may also be regulated by distributing the responsibility in a similar way; for instance, in connection with the charging of supplies used in the mine, account must be taken of the necessity of a mine-store through which explosives, steel, etc., are passed, and from which they are dealt out for use in the several working places. In such a store there is always a difficulty in attending to clerical work, and where attempted, it is often unsatisfactory. The system which has been found most satisfactory and reduces the work in the mine store to mechanical routine is as follows: Compartments or lockers, large enough to hold sufficient stores of all the regular mine-supplies are built in the store, one for each account or working place of which separate record is required to be kept, and is labeled with each distinctive name, thus: "Stoping" or "No. 1,No. 2, No. 3, stope"; "Development" or "Main shaft," "No. 6 Level"; "Equipment"; "Expense", etc. On each locker a tag marked with the distinctive name is kept hanging; the general storekeeper also keeps in the main store a corresponding weekly tally-sheet for each working place, made out as follows:

MAIN SHAFT

1906	Powder lbs.	Fuse Feet	Caps No.	Candles lbs.	Sundr's
On hand Jan. 1					
Jan. 1					
2					
3					
4					
5					
6					
7					
On hand Jan. 8					
Consumed					

At the beginning of every week, it is his duty to go to the store and weigh or otherwise check the supplies in each locker, posting them to his tallies. It is the duty of the man attending to the mine-store to keep the lockers supplied with material, and when any article is required, he writes it on the tag, the foreman signs it, and it is sent to the storekeeper who posts the amount given out to the proper date on his corresponding tally-sheet.

In this way confusion is avoided in handing out stores to the employees, while any leakage is quickly made apparent, and a tally is always in the office to be checked against the work done for the week. Thus the superintendent has constantly before him in his minute-book a weekly record of the work done and the labor and supplies expended, by which he may readily compare progress.

As regard work in the main storehouse, it appears to me that a card system is in every way the most suitable. A duplicate set of cards in the following form is kept, and all transactions are posted up daily:

STORES

CANDLES

Date	Amt.	Deatails	Price per Unit	In	Out
Jan. 1	1000	X. Y. & Co., $100.00+$10.00	0.11	110,00	
6	40	Mine Supplies (Stpg.)			4 40

ACCOUNTS

MINE STOPING

Date	Supplies	Cost	Cost
Jan. 6	40 lbs. Candles	4 40	

As stated at the outset, it is not sought to lay down rules with reference to the details of book-keeping, or even to claim superiority for any one method of collecting and posting expense-details at the mine. The main object sought is the clearer understanding of technical relations with regard to mining operations. It would seem that in the matter of defining technical responsibilities, half the battle would be fought, were the issues represented in mutually understandable terms; while a standardization of accounts would go far towards promoting this end, it would also assist materially by affording a better means of comparison by which both the conduct of technical operations and financial business would be facilitated.

Thickness of Water Pipes.—Pipes subject to uniform constant water pressure can be made much lighter than those subject to water hammer and to varying pressures due to starting and arresting the column of water as in the discharge pipe of a single reciprocating pump. Again, pipes which lie on the ground and which are not liable to be disturbed can be made lighter than those which, like the column pipes in vertical shafts, are subject to strains from being forced out of line by moving ground. Corrosive action of the mine water may also require extra thickness. All strains and destructive influences must be taken into consideration in designing a line of pipe, especially in mines where delays are nearly always expensive. The column pipes for underground pumps are, therefore, usually made several times the strength that would be required for a pipe line operating under constant pressure. What applies to strains in discharge pipes of pumps, applies, however, with greater force to such power pipes as are used for operating reciprocating hydraulic engines, because here the shocks are liable to be even more severe than in the case of pumps. The discharge pipes of centrifugal pumps are not so liable to water hammer and can therefore be considered in the same category as pipes subject to uniform pressure.—HANS C. BEHR.

Special Correspondence.

LONDON, April 25.

From Messrs. Bewick, Moreing & Co.'s report on the Great Fingall Mine for 1905, it appears that disappointment has been experienced in the continued shortening of the main ore-shoot and its much lower value at the No. 11 and 12 levels; although the ore in sight shows an increase of 131,799 tons over the previous year, the grade is lower. At the same time the reappearance of values in the No. 2 winze below No. 12 level (the deepest working on the line of the main shoot) and also the discovery of a branch from the main reef at the No. 4 level south are encouraging features. The No. 13 level will be driven as rapidly as possible into the region of the main ore bodies. During the year the main shaft was sunk 216 feet to a total depth of 1,532 feet, and altogether 7,983 feet of development work was done, resulting in the opening up of 335,116 tons of ore. The 100-stamp mill was run continuously during the year and treated 203,317 tons of ore, producing 159,798 oz. fine gold, valued at £681,728. The working expenses, including development, averaged 19s 9.3d, as compared with 19s 8.02d per ton in the previous year. Following the system adopted for economical working, a larger quantity of ore was broken in the stopes than was extracted. The total tonnage of such ore at December 31 aggregated 167,744 tons, representing an expenditure of £38,498, which amount stands charged to suspense account pending the extraction of the ore. The profit and loss account shows a net profit for the year of £451,556.

Another West Australian company, the Ivanhoe Gold Corporation Ltd., has issued its report for the twelve months to December 31, 1905. It states that the expenditure on mine development, buildings, plant and equipment, amounting to £59,612, has been written off in pursuance of the policy recommended by the board and approved by the shareholders in 1901. The total expenditure on these items since the formation of the Company, amounting to £637,314, stands in the balance sheet at the sum of £54,295, the amount of the company's original working capital. A further reduction in costs has been made. The working costs have been reduced to 19s 4.69d per ton, while the total West Australian costs, including the whole of the mine development, and the ordinary expenditure on buildings, plant and equipment, work out at 23s. 10.21d. per ton, a gradual reduction having been made during the last five years which began in 1901 with £1 11s. 8d. and £2 6s. 10d. respectively per ton of 2,000 lb. Including a final distribution of 9s. per share now recommended, the dividends for 1905 amount to a total of 24s. per share or £240,000, bringing up the grand total, during the existence of the company from February, 1899, to £1,510,000. The general manager's report shows that the 100-head mill ran 351 days during the year for a duty of 5.6 tons per stamp per 24 hours at a cost of 3s. 0.39d. per ton, including rock-breaking, transport and concentrating. The fine-grinding plant now consists of 15 pans, 12 taking the coarse product from the 100-head mill, and three being used to take any escaped sand from these twelve. The pulp that finally leaves the mill shows 1 per cent. on 40-mesh. The cost per ton of grinding raw sand works out at 1s. 0.48d. The quantity of concentrates now being saved by 34 concentrators and 14 slime tables is about 40 tons per day, and when the full complement of the latter are installed it is estimated 45 tons will be saved. The classifiers feeding the Wilfleys have been modified considerably, with good results. All the concentrate is now delivered into a pump, and is lifted to the settling vats over the roasting furnaces, thus avoiding the former shoveling and tucking. Four Edwards furnaces are employed full time in roasting concentrate, and an additional one is on order to cope with the increased quantity produced since the slime-concentrators started. During the year 10,960 tons were roasted, recovering 22,897 oz. fine gold, showing an extraction of 96 per cent., for a total cost of 12s. 11.4 per ton, the loss in residues being 1.80 dwt. During the year 95,275 tons of sand were leached by double treatment, producing 23,656 oz. of fine gold, showing an extraction of 65 per cent. of gold contents in this particular product, at a treatment cost of 1s. 9.7 per ton, the loss in residues being 2.73 dwt. In the slime treatment the filter-presses accounted for 90,334 tons, yielding 38,981 oz. fine gold and giving an extraction of 83 per cent. of the gold content, the loss in residues averaging 1.86 dwt. per ton. Bromo-cyanide is still being used in this department, where the total costs amount to 6s. 7.79d. per ton.

With regard to the extraction, the report states that the total tonnage amounted to 196,569, producing bullion containing 125,590 oz. fine gold and 35,604 oz. silver, the particulars of gold extraction being shown in the schedule below:

Fine gold won from	Total yield oz.	Yield per ton dwt.	Extraction per cent
Mill	40,056	4.075	27.06
Sand	23,656	2.407	15.98
Slime	38,981	3.966	26.33
Concentrate	22,897	2.330	15.47
Fine gold extracted	125,590	12.778	84.84
Loss in residue		2.282	15.16

In connection with the experiments made during the year the new Wilfley slime-tables had attention, and it was on the results of these that it was decided to install a number. The ordinary Wilfley concentrators are stated to have a tendency to lose a large amount of fine concentrate and the slime-tables are to be used in conjunction to arrest this loss. At the end of December there were fourteen of these working, and it is believed the effect should be noteworthy henceforth. In the mill, tests have been made on the various mesh of screens to determine the most suitable as regards tonnage and extraction. The most efficient screen was found to be about 225 holes per square inch, the concentrating being affected by any coarser mesh, with the result that a large proportion of mineral escaped the first row of Wilfley tables in coarse particles of sand, which, on entering grinding pans, was to a slight extent ground too fine for the slime-tables to catch, thus escaping to the sand and slime-plants. Finally, the ore reserves, above the 1,203 ft. level, amount to a total of 769,060 tons (of 2,000 lb.) and average 13 dwt. 23 gr. Including this company's shares, the Westralian market showed some activity last week, influenced partly by a cablegram from Great Boulder Perseverance announcing the cutting of the Lake View Lode at the 1,300-ft. level assaying 14 dwt. over a width of 9 ft. A favorable cable was also received from Great Boulder Main Reef stating that the diamond drill in the hole No. 3 in the north drive at 160 ft. had located the main lode orebody 40 ft. to the west, the width averaging 12 ft. for 14 dwt. per ton.

Under its heading of 'City Notes' last night's 'Globe' gives some pertinent reasons from its own point of view why Australian gold mines do not now command one tithe of the attention which British speculators and investors paid them a few years back. In the 'Globe's' opinion this apathy must have largely contributed to the decline which is noticeable in the Australian gold output. In round figures, the total output of West Australia, Victoria, Queensland and New Zealand fell off in 1904 by 100,000 oz., and in 1905 by another 100,000 oz., and a further decline is anticipated for the current year. It is pointed out that Broken Hill is very much to the fore at present, and the falling away in the gold industry is probably attributable in part to the increased attention which is being given to silver and base metals; also that unwise legislation in some of the colonies has imposed great hindrances on gold mining, and seriously discouraged the genuine prospector. But at the root of the whole mischief, the 'Globe' believes that 'Westralianism' will be found. The British public are sick of the market methods of the 'shops'—very few exist now, the majority having found that there are no customers for the wares on sale—and refuse to embark further capital. Under these circumstances, there is no demand among promoters for Australian properties. With the stream of British capital thus summarily checked, it is not remarkable that the volume of gold production should show a notable diminution year by year.

As a sign of the times the 'Financial News' has taken up the parable of Cornish mining. It asks: "How comes it that a little speck of England out of which the best authorities estimate £50,000,000 worth of copper, tin, silver and lead has been taken in the past two thousand years should relatively lie derelict and abandoned? Where there ought to be 200 to 300 properties at work —for the present prices of copper and tin would make almost any sort of Cornish mining proposition payable —a beggarly 13 companies are working, probably, a little over 20 mines. To the cynic the reason for the decay of Cornish mining is as plain as the nose on his face. They are too near home. Could they be but transferred to Thibet, the globe would probably ring with their richness. Distance often lends enchantment to the view in mining enterprise. Klondyke, with its golden creeks, far away on the border line of the Arctic Circle, could not fail to attract; Rhodesia, under the sway of a barbaric ruler, offered all the enchantments of a place out of the ken of civilization. But Cornwall! Can it be expected that a bit of sea-coast famous for its rocks, its cockles, and its shrimps can be associated in the public mind with still untold, undelved mineral wealth?

In an attractive retrospect some of the familiar scenes of by-gone days are brought back to the memory of veteran 'cousin Jacks.' Among the mines referred to are the Bottallack, worked for tin fifty years ago, making a profit of £300,000. On the point of being abandoned, in 1841, a rich course of copper was struck. The capital expended on this property returned in dividends five or six times over. The Balleswidden tin mine, also in the St. Just district, which returned £59,600 from 1833 to 1841; and the Levant tin and copper mine making in eight years a profit of £150,000 and employing 600 persons. The Boscowell Downs tin mine, which gave the adventurers, out of a single bunch of tin, between £15,000 and £20,000 in the course of a few weeks. The St. Ives Consols tin mine successfully worked for over 30 years, very rich in tin. The Wheal Vor mine is mentioned as having the first steam-engine ever erected in the county, between 1710 and 1714, and which employed 1,200 persons with at one time 15 engines in use. The Godolphin tin and copper mines which made a first profit of £50,000, and after being idle from 1836 to 1841, was taken up again and about £40,000 expended. The Great Wheal Fortune, which made a profit of £100,000.

As a matter of course the Devon Great Consols is not overlooked. It is described as the most astounding romance connected with the history of west-country mining. The narrator states that upon calls aggregating a little over £1,000 it paid in dividends, during its career, sums exceeding £3,000,000. Its £1 shares rose to over £800, and, astonishing as that may seem, they were dealt in on the London Stock Exchange as a humdrum investment, yielding at that price a very liberal return. The mine was originally worked as a copper mine, when the £1 shares were about £100 apiece in market value. In taking out the copper ore the arsenic underlay was left exposed; so when it became profitable, as it did, to work the arsenic, mining was carried on without practically any cost for development.

So much for the past glories of the 'old county' as recorded in the up-to-date 'Financial News.' Dealing with latter day events the 'Mining Journal' announces that : The first of the flotations of the Cornish Consolidated Tin Mines, Ltd., (see my Correspondence of April 11), is now practically settled, and will take the form of converting South Wheal Crofty from the cost-book to limited liability. The authorized capital of the new company will be £50,000, in shares of £1, of which about £35,000 will be available for working capital. Of this latter sum, £25,000 has been guaranteed. The directorate of the new company will include Mr. Francis Allen (Chairman of Clitters United and the Cornish Consolidated Tin Mines), chairman; Mr. Frank Harvey (Chairman of Dolcoath Mine), vice-chairman and Mr. R. Arthur Thomas (Manager of Dolcoath Mine), director. Two other directors will bring the number of the board up to its limit, viz., five members. The deal, whilst an exceptionally good one for South Wheal Crofty, will be equally advantageous to the Cornish Consolidated Company, who have early shown their knowledge of the industry by picking one of the few properties which, with judicious development, should in a short time become one of the large producers of the district. As it is proposed not only to push development energetically, but also to equip the mine with the latest and most up-to-date machinery, Crofty's output, of roughly, 25 tons per month, should within a reasonable period be at least doubled. This, under present metal market conditions, means something like 50 per cent. dividends on the capital engaged, and, according to the 'Mining Journal,' as the Cornish Consolidated will be holding about 25,000 shares in the new company, of which only 40,000 are to be issued, the possibilities for Cornish Consols—especially with other similar deals to follow—can hardly be over-estimated.

BUTTE, May 5.

An eight-hour work day has been adopted at all of the Amalgamated mines in Butte, and affects 10,000 men. For several years the miners have been working but eight hours for a shift, going to work on their own time that is, they reported at the mines half an hour before working time and were required to be at their places underground promptly on the hour. Beginning with the first day of May the men went into the mines on the company's time, making a difference of half an hour in favor of the men. At the same time the eight-hour day was made to apply to all other employees of the Amalgamated Co., who had been working nine and ten hours. The change will mean an annual difference to the company of about $600,000. The concession was voluntarily granted by the company, the new rule applying as well to smelters of the company at Anaconda and Great Falls. In making the announcement John D. Ryan, managing director, stated that the Amal-

gamated Co. is out of politics and has no favors to ask and no enemies to punish.

New companies continue to be organized to explore for copper in Butte district. A scheme is projected to explore the mountain range east of Butte district. It has long been the opinion of local mining men that at depth there are copper deposits in the mountain, but the heavy cost of sinking to the necessary depth has always deterred men from exploring there. Now, however, the demand for copper is considered sufficient to justify the venture, and owners of claims on the mountain are organizing a company to run a tunnel near the base of the mountain to demonstrate whether there are paying copper veins there.

Ten carloads of machinery for the new hoisting plant at the Leonard mine of the Boston & Montana Co. have arrived. The engine is a duplicate of that recently installed at the North Butte, and is designed to work to a depth of 3,500 ft. Above 1,200 ft. the Leonard has been producing a large tonnage for many years. It is still one of the rich mines in the district above that level. For several years the East Colusa mine was worked through the Leonard shaft, but is now again being operated through the old Colusa shaft, because the Leonard is not equipped to handle the ore rapidly. The shaft on the West Colusa mine is being sunk from the 1,600-ft. point to 2,000 ft., which will give 400 ft. additional stoping backs. Owing to lack of lumber the Boston & Montana Co. closed the Pennsylvania mine three days last week, but a plentiful supply is on hand and the mine is working to full capacity again.

The Butte-Northern Copper Co. is driving a tunnel and sinking a shaft on its property north of Walkerville. The tunnel is in 60 ft. and the shaft is down 55 ft. Oxidized copper ore is coming from both workings. The property is in the neighborhood of the mines of the Butte and Bacorn company.

F. A. Heinze has sold all of his interest in the Davis estate mines to J. A. Coram, who is organizing the American Consolidated Copper Co. This disposes of the report that he will be associated with Mr. Coram in the flotation. Mr. Coram says Mr. Heinze will hold stock in the corporation, but will have no other interest in it. Mr. Heinze's interests in Butte district are now limited to that of a stockholder of United Copper, Butte Coalition, and whatever interest he will have in the Coram company.

The Afro-American Mining and Milling Co., with a capitalization of $200,000, has been organized by Butte and New York colored men, including Charles F. Jones, of Butte. The company owns five mining claims in the northwestern portion of Butte district, and six in Madison county.

The main shaft being sunk by the East Butte Mining Co. has reached a depth of 400 ft., at which point a pump station is being cut, a large amount of water having been encountered. It is expected the shaft will reach a depth of 500 ft. early next month, when crosscutting will begin, while sinking continues.

Among the new companies recently organized, exploration work is being done by the Butte & London, Butte Copper Exploration Co., Butte-Milwaukee Co., East Butte Extension, Butte Copper Co., Butte & Bacorn, Butte Hill Copper Mining Co., Butte Northern, the General Development Co., Bullwhacker Mining Co., and the Calumet & Butte. A score of others have not yet started work.

Arthur C. Carson, general manager of the North Butte Mining Co., has also been made general manager of the Butte Coalition and Red Metal Co. interests in Butte, while George E. Moulthrop, for many years connected with the Boston & Montana Co. as foreman of the Pennsylvania mine, has been made general superintendent of the Red Metal operations.

A deed conveying from Thomas F. Cole all of the United Copper properties in Butte to the Red Metal Mining Co. has been filed for record in Butte. A release of the $2,500,000 mortgage on the property of the Nipper Consolidated Co., one of the United Copper concerns, has also been filed.

The Pittsburg & Montana Co., since its smelter has been shut down, has been shipping 100 tons of ore per day, to the Washoe smelter at Anaconda. It is probable this will continue for a long time, and that the Pittsmont smelter will not soon be rebuilt, as it has been found that the company can more economically have its ore treated by the Washoe. There is a move on foot to reorganize the Pittsburg & Montana Co., pay off its debts, amounting to nearly $2,500,000, and put the company on a firmer basis. The company has mines capable of yielding 300 tons of ore a day, but for three years or more they have been doing little else than experiment with a new smelting process.

The East Butte Copper Mining Extension Co., organized recently, has bought the Westlake mine, situated between the Pennsylvania and Belmont mines. Although the shaft of the Westlake is only 200 ft. deep, the former owner took out $200,000 above that depth. The company now has half a dozen small mines, and is sinking a central shaft, which has reached a depth of 70 ft. The manager, Mr. Cooney, expects to reach a depth of 200 ft. by the first of June. At that point a station will be cut.

The Butte-Milwaukee Co. has added the Florence and Stonewall claims to its holdings in the North Butte district. The Florence has a 70-ft. shaft and a vein 25 ft. wide, from which considerable ore has been mined, carrying $7 to $10 silver and gold per ton. The company will develop the Florence. The group now comprises the Pollock, Colonel Sellers, Bird, Comstock, Stonewall and Florence. The Butte-Milwaukee also owns seven claims in Argenta district.

The Frank Moulton mine, a silver property owned by one of the W. A. Clark companies, is to be re-opened. The property has not been worked since 1893, but a number of lessees have taken it and have put up a new hoisting plant, and retimbered part of the shaft. The shaft of the Moulton is down 900 ft. and contains 200 ft. of water, which is being pumped out. The Moulton carries two classes of ore—silver-gold and zinciferous. Both will be mined, and the zinciferous ore will be sold to the Montana Zinc Co. The vein is the same as that passing through the Alice mines of the Butte Coalition company.

The Butte-Hercules Copper Co., one of the recently organized concerns, has let a contract for sinking a 200-ft. shaft on the Key West, one of the eight claims owned by the company, and located about a mile southwest of Butte. The company succeeded to the interests of the old Silver Bow Mining Co. and acquired others.

DENVER, May 4.

The American Mining Congress is proceeding with plans to have its own building in Denver. About two weeks ago a plan was formulated to raise funds by the issuance of bonds. It was figured out that by erecting a semi-commercial building the rental of stores and offices would easily pay a low percentage on the investment, say 3 to 4 per cent, and it was thought easier to sell low interest-bearing bonds to interested parties than to secure outright gifts. Then again it was planned to let all the rentable space to representative mining and metallurgical interests, so that these headquarters would become the central beehive of mining industry. The plan, as briefly outlined above, was submitted to the Committee of Mines and Mining of the Denver Chamber of Commerce some two weeks ago and was endorsed by them. I am glad to learn that the plan has been dropped. It appears that both D. H. Moffat and Simon Guggenheim disapproved of it; both of these gentlemen have agreed to contribute liberally to the building, so I understand, and both are united in the idea that it must be kept free from all commercialism. As I understand the aims and objects of the American Mining Congress, they are to foster the interests of the mining industry, to promote and originate legislation favorable to mines and mining and to protect the vast army of small mining investors as far as possible. It can readily be seen that the object last mentioned might be seriously endangered if the officers of the Congress were more or less at the mercy of their tenants to get the money to meet the interest on the bonds. Mr. Moffat declares that headquarters must be built purely by donations, and I think the mining fraternity will agree with him.

The directors have decided to hold the ninth annual meeting of the Congress in Denver, extending from November 13 to 17, inclusive. The directors appointed the following committees: Program—E. A. Colburn, Denver; E. A. De Lavergne, Colorado Springs; V. C. Alderson, Colorado School of Mines; C. Willard Hayes Washington, D. C.; Edward H. Benjamin, San Francisco. Building—D. H. Moffat, Denver; E. A. Colburn, Denver; A. J. Spengel, Denver. Transportation—Samuel F. Dutton, Denver; A. G. Brownlee, Idaho Springs; Edward J. Wilcox, Denver; H. J. Sieman, Denver; J. F Callbreath, Denver. Membership—E. G. Reinert, Denver; E. A. De Lavergne, Colorado Springs; J. F. Callbreath, Denver. Finance—W. F. R. Mills, Denver; with authority to choose associates. Drainage districts—D. W. Brunton, E. Lyman White, F. J. Campbell, R. S. Morrison, E. A. Colburn, all of Denver. Building construction—J. H. Richards, Boise; E. A. Colburn, Denver; Thomas Ewing, Vivian, Ariz.

Few people have any idea of the mineral richness of the Clear Creek Basin. There are six mines in that district that have declared more than a million dollars each in dividends. Mines that declare a million in dividends are rare and the people of Clear Creek are a resourceful people. For instance, Idaho Springs and Central City both have their own iron works, which supply practically all the repairs and a good part of the original installation of all the mills in the basin. They have their own dairies and raise a large part of their own garden truck. Every town has its own butcher shop, supplied with mountain-raised beef, and one man at Forks Creek is starting an angora goat herd to gather profit and sustenance from the steep side hills where cattle cannot thrive. Idaho Springs has wagon factories, harness factories and many other little industries that tend to keep the miners' money at home. The saw mills of the basin supply nearly all the lumber used in the district and practically all the mine timbers come from the adjoining forest-clad hills, but perhaps the most advanced of all the local industries is the utilization of water power. All this internal development is along the lines that experience has shown to be the best stimulant to a flourishing mining industry, but unfortunately the very spirit which has made Clear Creek basin more nearly self-sufficient than any other district in the State has also bred a clannish feeling which disdains the value of advertisement and outside technical knowledge, and treats the outsider with precious little consideration. This spirit is, however, fast disappearing under the leadership of such progressive spirits as J. J. Sherwin of Idaho Springs, George Stewart of Alice, Col. Desch of Georgetown, Lieut. Charles Ripley of American City and Mr. Renshaw of the Gem mine at Idaho Springs. Chief among the new enterprises originated lately by one or the other of these gentlemen may be mentioned the enlargement of the United Hydro-Electric plant at Georgetown, the building of new wagon roads and the crystallization of railroad plans to serve the James Peak country, the intelligent investigation of the milling problem at Idaho Springs and the advertisement of the Clear Creek basin by the Idaho Springs Chamber of Commerce. The enlargement of the United Hydro-Electric plant consists of the installation of one 750-h. p. Pelton wheel, direct connected to an electrical generator and a 500-kw. Parsons-Westinghouse steam turbine and generator. The reservoir capacity will also be greatly increased; altogether $100,000 will be spent and nearly all of this money is advanced by the local people.

This electric power plant at Georgetown has been a great stimulus to the mining interests of upper Clear Creek. The five mills (four new ones) at Silver Plume are all run by power from this plant. The Scotia Mining & Milling Co. at Silver Plume have just let a contract for their mill. When this mill is completed Silver Plume will be milling 400 tons daily. The Dives-Pelican people are now building a tramway; when this is completed they expect to enlarge the capacity of the mill.

The Argentine Central railroad is an enterprise backed purely by mining capital, and I am told it already shows that it will be even more successful than the Gilpin County tram line, which was the first local enterprise of the sort. This new railroad starts at the Colorado Southern tracks and winds its way up the rocky hills toward East Argentine. Ten miles of it was completed last fall and materials are even now on the way to extend it five miles this summer. E. J. Wilcox was the moving spirit in this enterprise, and his mines, the Waldorf Mining Co.'s properties, will furnish the greatest tonnage, for a time at least.

A strike has just been made on the Little Mattie, which illustrates most forcibly two remarks that I have recently made respecting this part of the country, namely, the disdain for engineers and their ways and the reduction of mining costs due to advance of mining and milling methods developed very largely in Denver. The Wild Rose claim was owned from 1885 to 1894 by J. J. Sherwin and associates. They had some good practical miners working for them and knew that these miners had opened up some ore having a value of about $25. No maps of the property were kept. The keeping of exact records is not Clear Creek style. The men who were putting up the money were of the opinion that the amount of $25 ore opened up was comparatively small, and besides, ore of that grade was not much good at that time. So the work was stopped and later on the shaft caved in and still later it was sold to the Little Mattie Co. for a small sum. This week some lessees got the shaft cleaned out and timbered. Mr. Curtis is one of the lucky men. They find already blocked out enough $25 ore to put all interested in the lease on easy street. Moral for those 'putting up the money': Employ an honest and intelligent engineer.

Around Idaho Springs there is too much going on to tell this time. I will just mention a few points of interest. The most important event is the starting up of the Newhouse tunnel. I don't know anything about this scheme from the sockholder's standpoint, but from the standpoint of a local citizen the enterprise is of inestimable value to that great mineralized section lying

between Idaho Springs and Central City. I understand the tunnel lies 2,000 feet under the summit of Seaton mountain and about 1,000 feet under Central City. To my mind the great value of this enterprise consists of the enormous territory it makes available for easy prospecting. Developed ore they say is about as cheaply hoisted as trammed out of the tunnel, but there is no comparison between prospecting drained and undrained territory. It is said the Newhouse tunnel will be pushed to the California vein this time without cessation of work.

The people who own the famous old Saratoga got tired of waiting for the tunnel to drain their mine, although the vein is being worked through the Newhouse tunnel, so manager John Owens has started unwatering from the surface and has also been considering putting some diamond-drill holes up from the Newhouse. It is said that the principal motive in this work is the fear that a human life or two might be sacrificed if the flooded workings of the Saratoga were tapped by a raise, before the pressure had been relieved somewhat by other methods. Corporations are not always so considerate of matters outside the profit and loss columns. It would obviously be cheaper to stand a damage suit or two for miners killed than to unwater the Saratoga from the surface. At the present time the Saratoga and the Sun and Moon are drifting eastward from the tunnel, while the Old Town, Gem, Addudel, Queen, Jackson Leasing and Orr Mining Co. are driving or have driven west.

A few more brief notes and I must close. The Hoosac tunnel has resumed and cut a rich vein. The Lucania tunnel, on Fall river, has struck enough ore to make Judge Colburn wear one of those "smiles that won't come off." The Comstock people say they have 200,000 tons of $6 ore developed. Pretty big order, that! The Two Brothers has opened an ore-shoot that has "millions in it," so they say. The Big Five Central, in drifting on the Shafter vein has opened up so much ore that I won't put in print what the owners think about it. We have all heard of the world's tail and the down-hill pull before. The Burns-Moore and the Honest John discoveries up Chicago creek are of importance, because both indicate the extended mineralization of a large series of strong veins. The Burns-Moore strike is the most substantial of the two as far as developed at this writing. The Rockford Bore has cut ore of smelting richness, but I will keep the rest till next week. I hope some time in the near future to give the readers of the Mining and Scientific Press a somewhat accurate account of the bodies of low-grade ore developed recently in the Clear Creek basin. All I can say at present is that as far as I have seen and heard this district is going to surprise the State with its low-grade production in the next few years.

DENVER, May 7.

A strike in the Mammoth mine at Leadville has caused considerable speculation in view of the trend of the ore-shoot, as it does not seem to be connected with any of the known orebodies in that locality. The trend of the ore—northeast by southwest—would seem to show its connection with the large shoots of Fryer and Carbonate hills; it trends toward the Canterbury hill, and this fact has aroused new interest in that vicinity. A large body of ore has already been disclosed by the shaft, sufficient to demonstrate that the ore exists in an unusually large body; it assays about 130 oz. silver and 30% lead per ton.

Mr. Hoyt, manager of the Ross smelter at Silverton, has made several successful runs, producing a 55% copper matte. On account of the closing of the roads to the mines by snow, the smelter has been temporarily shut down for lack of ore, and will be started up again as soon as the roads are opened. This enterprise means much for San Juan county, which is capable of producing a large tonnage of low-grade copper ore, such as cannot carry the burden of freight and smelter charges. It is the intention of the Ross company to increase the capacity of the plant up to the tonnage obtainable.

Mr. Reece C. Vidler, manager of the Transcontinental Transportation and Mining Co., has returned from London, and is pushing the Vidler tunnel at Argentine with renewed vigor. He has purchased an air-compressor, of 1,200-ft. capacity. This will replace the smaller one at the tunnel. Other and heavier machinery is to be installed.

The Crescent mine, of the Bull Hill Development & Mining Company, at Cripple Creek, is increasing its output. Recent development work has disclosed a greater extent of ore, and of higher grade. The mine is now producing about 100 tons daily, the output being limited by facilities for handling. On April 28 a station was started at the 700-ft. level, from which a drift will be run to cut the ore at that depth. The company is preparing to install a heavy hoisting plant and an aerial tramway to transport its ore to the Sovereign switch.

The Marsh and Hodges lease on the Little Clara claim of the Work Co. promises to be one of the biggest strikes made in Cripple Creek for a long time. The ore was encountered by a 50-ft. raise from the Ophelia tunnel, following a rich seam which led to the 'flat vein' of Gold Hill, from which the Mary McKinney produced a large amount of ore. The orebody has been opened for a thickness of nine feet by 50 ft. long and 50 ft. laterally, without reaching its limits. The ore is said to carry five ounces of gold per ton, as sampled in the mine. Through the average grade appears streaks of nearly solid sylvanite three and four inches wide.

Notwithstanding the closing of a number of the Cripple Creek producers, it is claimed that the April output of that district, not yet published will exceed that of any month since November, 1905. All the sampling works have been run at full capacity.

It is reported that fair-sized veins of ore, valued at $5 to $20 gold per ton, are being opened in the South Park district, near Hartzell, on the Colorado Midland railroad. For a number of years past, considerable prospecting has been going on in that section, but though the ore was fair, the veins were small.

The Doric Trust, of London, England, has sold the Doric tunnel, near Georgetown, to the X-Ray Mining Co. The X-Ray company controls the Magnet group of mines on Saxon mountain, and the tunnel is a valuable addition to the economical operation of the mines. The heading of the tunnel is now into the Magnet ground, a distance of over 3,000 ft. from the portal. The Magnet group is said to have produced between one million and two million dollars' worth of ore. The tunnel cut several pay-veins, but no driving to speak of has yet been done on any of them.

Several months ago Bernard J. O'Connell, of Clear Creek county, sent a signed article to the Denver 'Daily News' directed against the Smelter trust. Mr. O'Connell again returns to the attack and cites the case of a miner who shipped 28½ tons of lead to the Trust smelter, and states that according to the schedule for Clear Creek district, after deducting freight and treatment, the miner should have received $1372; instead he received $570. Mr. O'Connell invites Simon Guggenheim of Denver to an open discussion of the question, and Mr. Guggenheim invited Mr. O'Connell to attend a private discussion of it. In a recent letter, Mr. O'Connell raises the question whether the amount said to have been withheld from the miner is collectable by law. Aside from the political animus of his letters, Mr. O'Connell has opened a question of interest to miners everywhere. The complaint is general and of long standing, and small shippers, particularly, have never been able to figure out from the smelter schedule, treatment charges and freights, what their settlement checks would be on any given grade of lead ore. The question is older than smelter trusts, and a remedy has long been sought. It is quite likely that the Trust could be legally compelled to return the ore, but what the courts would do with the extra amount claimed for the ore is worth finding out.

BUTTE, May 1.

The Butte Commercial Copper Mining and Development Co. is the name given a new corporation organized in Butte which is trying to interest Eastern capitalists in financing the enterprise. The company is one of several score of new companies organized on options on undeveloped mining claims far from developed mines.

Thomas F. Cole has transferred all of the United Copper properties, the title to which stood in his name since the settlement of the copper war between Heinze and the Amalgamated Company, to the Red Metal Mining Co., a New York corporation. The latter is the operating company formed when the Butte Coalition was organized by Mr. Cole and Mr. Ryan. The transfer includes all the mining interests mentioned in the deal with Heinze, but the property is subject to a $1,000,000 mortgage given by the Montana Ore Purchasing Co. and one for $2,500,000 given by the Nipper Consolidated Mining Co., both Heinze corporations. It is understood that the transfer concludes the deal by which the Red Metal and the Butte Coalition become owners of all of the United Copper properties in Butte. A few days ago, by stipulation of the attorneys, the receivership of the Snohomish and Tramway mines was terminated and all matters that had been in controversy between Heinze and the Butte & Boston Company were decreed as settled. The Butte Coalition and Butte & Boston will now operate the two mines which were shut down by the litigation for a number of years. The Nipper mine, another big property for many years under injunction, will soon be operated by the new owner.

The Butte Hill Copper Co. is making good progress in developing its extensive holdings in the new district north of Walkerville. The shaft is being sunk in a vein from which fine bunches of copper ore have been taken.

The Butte & Bacorn Co. is operating in the same neighborhood and has three shafts working. The new hoisting plant has been put up on the Colleen Bawn claim and the company has started crosscutting at the 100-foot level. The men interested in the Butte & Bacorn, including a number of Amalgamated officials, have the utmost confidence in the property. If they are successful in their search for copper in that portion of the Butte district it will add many miles to the mining ground of Butte.

The April production of copper from the mines of the Butte district amounted to 30,842,400 pounds. The output of ore was about 424,800 tons, a little less than 4 per cent copper, or 80 pounds per ton of ore. Preparations are in progress for a largely increased output by the Amalgamated, North Butte, Butte Coalition, East Butte and Raven companies, and it is likely that the monthly production of copper will shortly reach 35,000,000 pounds. The following table gives the averages in ore tonnage, yield per ton and gross daily yield during April:

	—Ore—	——Copper——	
		Lb.	Total
Name of company.	Tons.	per ton.	lbs. daily.
Boston & Montana	3,700	70	259,000
Anaconda	4,000	68	272,000
Butte & Boston	650	60	33,000
Washoe	500	63	31,500
Parrot	560	68	38,080
Trenton	520	80	31,200
North Butte	950	130	123,500
Butte Coalition	1,600	65	104,000
Clark's Original	800	75	60,000
East Butte (lessees)	200	90	18,000
Raven	80	110	8,800
Miscellaneous	700	70	49,000
Total	14,260		1,028,080

The following table shows the total ore tonnage and total copper output in pounds for the month:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	111,000	7,770,000
Anaconda	120,000	8,160,000
Butte & Boston	16,500	990,000
Washoe	15,000	945,000
Parrot	16,800	1,142,400
Trenton	15,600	936,000
North Butte	28,500	3,705,000
Butte Coalition	48,000	3,120,000
Clark's Original	24,000	1,800,000
East Butte (lessees)	6,000	540,000
Raven	2,400	264,000
Miscellaneous	21,000	1,470,000
Total	424,800	30,842,400

The Cable Consolidated Mining Co., operating the Cable mine, the biggest gold property in Montana, has installed a lot of new equipment at the mine and is hoisting daily a lot of good ore which is treated at the company's mill.

The shaft which the Butte Copper Exploration Co. is sinking on the Six O'Clock group in the northeastern part of the Butte District, has reached a depth of 500 feet. The company will sink to 1,000 feet before crosscutting.

A strike of copper ore has been made by lessees in the Bertha mine on the east side, near the property of the Pittsburg & Montana Co. The Bertha is a small triangular piece of ground, but a vein 15 feet wide has been opened and 30 tons of ore are shipped from it daily, the ore running about 7 per cent copper. It adjoins on the west the Pacific mine of the Butte Mines Exploration Co. The Pacific is well developed and the only apparently good property in the Butte district that has remained idle during the present boom in copper and copper properties. The principal stockholder is a Baltimore brewer, who put up money for its development five or six years ago, but he grew tired of the speculation and shut down the property. Since then nothing has been done with it.

The mines of the Raven Mining Co. are showing up better as development progresses. The company is hoisting 80 tons of ore a day, during the course of development, and ore is being blocked out.

An alloy with which it is claimed aluminum may be soldered is composed of seven parts of aluminum and one part tin.

MINING SUMMARY

ARIZONA.

GILA COUNTY.

(Special Correspondence).—Mine development in the territory west of Globe, between the Black Warrior mine and the east line of Pinal county has been rapid. Several of the mines opened, have become important shippers. The Live Oak leads in shipments, sending out 125 tons daily, the ore going to El Paso and Douglas and some to the Old Dominion smelter at Globe. There are 40 teams on the road hauling ore from the Live Oak, where there are 300 men on the payroll. Joseph C. Erman is superintendent, but the property is being worked by Boon & Strange, lessees. Their lease has nearly eight months still to run and it is estimated that they will clean up a quarter of a million dollars by the time it expires.

Globe, May 2.

MOHAVE COUNTY.

(Special Correspondence.)—Owing to the failure to obtain sufficient wood for the Pyramid mill, in Signal district, W. C. Howard, superintendent, has contracted for fuel-oil, some of which has been delivered. Hereafter it is proposed to use fuel-oil at the mine and mill, and as soon as a larger supply can be received, the mill will be started up on ore from the Kathryn and Sheep-trail mines, as well as from the Pyramid group. Several hundred tons of ore are now on hand and the stopes are opened sufficiently to insure a supply for eight or ten months.

W. H. Cushing has returned from Kansas City, where he purchased a 100-ton mill for the De la Fontaine mine at Stockton hill. The mill will be shipped from Kansas City and will be erected on the Cupel mine, one of the group belonging to the company of which Mr. Cushing is superintendent. The two mines will keep this plant running for a year or more without opening up any new ore, there being 40,000 tons in sight in the De la Fontaine alone. In the Cupel there are large orebodies that can be handled in the mill. At the 380-ft. level of the De la Fontaine the east drift is in concentrating ore. The drift has been driven into this orebody 35 ft. and the ore is improving. It is six feet wide. In the west drift from the same level the orebody is somewhat broken, but good ore appears all through the vein. The water is at this level and is slowly rising.

Kingman, May 1.

YAVAPAI COUNTY.

(Special Correspondence).—O. B. Marshall, who is developing a group of claims in Big Bug district, states that his shaft is now down 90 ft., and that the ore is better than at the surface. W. L. Roberts is exhibiting in Prescott a large quartz specimen glittering with gold, which was taken out of a claim recently discovered by him on the Skull Valley slope of the Copper Basin divide, about three miles from the Derby mill. After making the discovery ten days ago, he commenced to run a tunnel on the vein and now has seven tons of ore on the dump, with a 20-in. vein in the face that will mill over $50 per ton in free gold.

Prescott, May 4.

YUMA COUNTY.

(Special Correspondence.)—Allan J. Smith, manager of the California King Gold Mining Co. writes to Capt. Polhamus, at Yuma, that he and Mr. Doak will arrive in Yuma the latter part of the week, prepared to start work on the property as soon as the supplies and tools can be moved to the camp. The California King property is a gold proposition at Picacho, and is owned principally by Joe Mendiville, Allan J. Smith and Capt. Isaac Polhamus. The ore is low grade, but there is a large body of it, and it can be worked profitably on the scale of operations which the owners have in view.

Yuma, May 3.

CALIFORNIA.

NEVADA COUNTY.

C. H. Mallon, Superintendent of the Brunswick mine near Grass Valley, has placed an order for lumber for a 20-stamp mill.

PLACER COUNTY.

J. R. Nickerson has sold his group of claims on Rock Creek to the Guggenheim Company for $60,000. The mines are at present flooded but are to be unwatered and development extended. The ore carries copper.

SAN BERNARDINO COUNTY.

A gold and copper strike has been made near Kelso, along the Salt Lake railroad. Twelve miles southwest of there, in the Winston Basin, among the Providence mountains, several parallel ledges averaging $40 gold per ton, and running high in copper, have been uncovered.

The ledges for three miles have been located, sixteen prospectors having united their interests in the properties, who propose to develop several of the claims, with the expectation that a permanent mining district will result.

SIERRA COUNTY.

(Special Correspondence):—It is reported that the Sierra Buttes Company is negotiating for the purchase of the Biglow mine, which is supposed to be the same vein as that in the Sierra Buttes. The Sierra Buttes Company report having enough ore in sight to keep their 60 stamps going for years. The mine has been producing for more than 50 years.

The Bullion mine under new ownership expects to soon begin active operations.—— The Keystone, or Sierra Alta has resumed operations and will soon start the mill. Fred Pennyman is Supt.—— The Marguerite expect to complete their drain tunnel soon.—— The Cleveland is reported running on good ore.—— The Sovereign is still doing development and have a large body of good ore.—— The Empire, in Gold Valley, had to hang up their mill for a short time owing to accident to the dynamo. They have been running on rich ore recently.—— Robert Nisbet has purchased the O. A. Edholm mine on the North Fork. This is a combination of quartz and gravel. He has a force on development.—— The Telegraph is sinking an incline on some deep gravel in the old channel. They expect to get to bed rock in a week.—— Peckwith & Spaulding at the West Point Mine took out two $50 nuggets last week and also made a good clean-up of fine gold. This is a continuation of the White Bear Channel.—— The Last Resort is driving on the ledge, which prospects well.

H. L. Johnson has begun development on the Eldorado ledge which in the past has produced some large pockets.—— The Tightner has been installing an electric hoist.—— The Oriental has resumed operations with twelve men.—— A new tunnel is to be run from Oregon Creek to tap the ledge in the American Flag Mine, which will give them 1000 ft. of backs. This is owned by Messrs. Jackson, Hathaway and Meek.—— Work at the Alaska is progressing. They will sink the new shaft 700 ft. before crosscutting. The old shaft was only 450 ft. deep and stopped in rich ore on account of water. The management will install electric power.

Downieville, May 5.

SISKIYOU COUNTY.

On Butcher Hill, a mile north of Yreka, gold has been discovered in stringers exposed in a cut dug for a railroad. Hydraulicking is in progress on Little Humbug Creek. The water from the creek is raised by centrifugal pump and the stream used in washing the gravel. At Quartz Valley and Oro Fino the hydraulic mines are in operation, with abundance of water available. The quartz mines of that district are also in operation. The Morrison and Carlock mine is working steadily at Quartz Valley. Sinking is in progress and the upper levels are being developed.—— On Indian creek the Golden Eagle mine is reported yielding steadily and satisfactorily. During March $4,000 were taken out with three stamps. Howard Lewis is Superintendent.

The Yreka Journal says the hydraulic mines on all the small streams tributary to Klammath river, from the mouth of Scott river to Humboldt county, are working gravel. By breaking surface hardpan with powder the giants are able to move a large amount of material daily, with good profit.

Near Oro Fino it is reported that Frank Quigley has recently sold 55 acres of his farm for dredging purposes.

The Wright and Fletcher claim at Oro Fino is running with giant and elevator. Eastlick Bros. are opening up the Wilson tract, and the proposition is reported to be a success. Two giants are employed in piping.

Frank Starr is getting out rich ore for his arrastre, which he will operate during the summer.— The Medina Mining Company is preparing to put on a crew to clean out their ditch. They expect to cut the vein at any time. The work of prospecting and development continues.— Hydraulic elevators will be placed on the Ethelynn mine on Horse Creek near Oak Bar. The gravel is three feet deep and can be worked by elevators better than in any other way.— At the mouth of Empire Creek, Klammath river, Carter and Taylor are drifting on bedrock.— I. O. Harrison is to mine under the race track one mile south of Yreka, where bedrock is thought to be 100 ft. deep with pay gravel 4 to 10 ft. deep.— John Garvey has been preparing to work his placer claim on Klammath river by means of hydraulic elevators.— Harvey Bowerman has a lot of ore out at the Wild Irishman mine, near the King Solomon mine and will commence milling as soon as he can pack the ore to the mill.—Ladd and Patton are working their quartz claim on Horse Creek and have cut their ledge 60 ft. deep, and drifted 50 ft. each way on it. The vein is 18 in. wide and will mill $30 per ton. They expect to build a mill.— The Canon Mountain Co. owning the King Solomon mines are putting on a larger force and getting ready to build a wagon-road from Black Bear to the mine. They will build a stamp mill and cyanide plant.— Simon Cauzetti is developing his quartz claim at Board Tree gulch in Salmon River district, with promising prospects. He will put in a small mill this season.—— The Salmon River Mining Co. is working the Petersburg claim night and day. They made a good clean-up last month.

COLORADO.

CLEAR CREEK COUNTY

(Special Correspondence.)—Some of the mines around Georgetown are handicapped on account of the condition of the roads, while others are in a position to make their usual production. Work is progressing as rapidly as possible in the East Argentine and indications point to a busy season in this particular district. The Capital Milling & Transportation Co., situated close to town, is driving a tunnel 180 to 200 ft. per month, and, at the rate they are now working, expect to reach the Colorado Central belt by the middle of July. The tunnel is now in 3,200 ft. Wm. Cooper is manager.

Georgetown, Colo., May 5.

(Special Correspondence.)—It is reported that the Scotia Mines Co. operating in this vicinity will erect a small mill for handling the product from its mine.

The Corry Mining Co., C. S. Desch, resident manager, is expected to install a new mill during the summer.

J. H. Eaton, manager the Dives-Pelican mine and mill, states he is now handling 150 tons of material per day through his mill at a cost not to exceed 90c per ton for mining and milling. He is erecting an aerial tramway to handle the material from the old Pelican dump to the mill.

It is reported that Dr. Burt, of this place, is now in the east securing money to place a plant of machinery on the old Smuggler group of claims. He recently organized the Maine Gulch Mining, Milling & Transportation Co. for operating the Smuggler claim on which he has a lease.

Silver Plume, Colo., May 4.

The Brighton mine at Freeland has received part of its new electrical equipment and the remainder is being hauled to the mine. The shafthouse, which is 18 x 36 ft., has been completed. The plant includes a Westinghouse induction motor, direct-connected, about 75-h. p., and a 16 x 18 Leyner air compressor; a 20-h. p. motor is also to be installed, to operate by gear connection, and a three-plunger electric pump.

Regular shipments of milling ore of the Dover-Brighton mill are being made, and to facilitate ore sorting a large grizzly and additional ore plats are now being built. Development work is being carried on with double shift, and with new equipment additional air drills will be employed for mining 50,000 tons of ore, varying in grade from milling to smelting, now blocked out in the mine. The levels west are penetrating new and better territory, the contour of the mountain giving additional depth as the levels are extended.

LAKE COUNTY.

The Rawlins mill, of the Boston & Arizona Mining & Milling Co. at Leadville, are ready to start up and will handle ore from the Fanny Rawlins, which carries gold and silver, lead and zinc. The mill is supplied with all of the up-to-date machinery and is driven by a 40-h. p. motor. The mill has a capacity of 50 tons per day and will turn out a clean product of concentrate.

LA PLATA COUNTY.

(Special Correspondence.)—As soon as the weather will permit it is expected that a large amount of work will be undertaken in La Plata district. The May Day is one of the big producers of the county and the indications point to a larger production than ever. It is expected the railroad will be completed in time for summer traffic from the main line of the Denver & Rio Grande to the mine. This will facilitate matters materially. A few miles farther up the gulch the Tomahawk Mines Co. is preparing for extensive development of what was formerly known as the Little Jane. The

Little Jane Co. was organized several years ago and several thousand dollars spent in developing and prospecting the property. After a time work was abandoned, and the president of the company, Mr. E. H. Lunken, of Cincinnati, Ohio, refunded all the money that was paid in by stockholders. Since then the property has been idle. In the meantime a thorough examination of the property has been made and it was thought advisable to reorganize the company and start operations anew. Former stockholders were given an opportunity of taking stock in the new enterprise. The new company is managed by E. H. Lunken, president, Cincinnati; F. T. Henry, secretary, Denver; G. W. Gilmore, treasurer, Denver; D. M. Forker, director, Pittsburg, and Julius Uihlein, director, Cincinnati. A large air compressor will be installed, when work will begin on a long tunnel. In some places snowslides do considerable damage. The past few months the power plant of the Bonnie Girl mine was put out of commission by a huge slide near the town of La Plata.

La Plata, Colo., May 1, 1906.

SUMMIT COUNTY.

(Special Correspondence).—The Laurium mine has been sold by Niles & Walker, to a company which intends to double the mill capacity and put on a large force; this mine, which is situated on Nigger Hill above Illinois gulch, is well opened up and has a large quantity of milling ore developed. The Hamilton mine in Summit gulch has been leased to a party of capitalists by the owner, A. W. McFarlane, of Denver. George C. Forsythe of Breckenridge has returned from a protracted stay in the East, and reports good progress in the financial affairs of the Coyne Mining & Milling Co. which has valuable holdings on Peak 1, of the Ten Mile range, and Mr. Forsythe says that various development work will be started as soon as the snow disappears sufficiently to enable the commencement of operations.

It is reported that the Briar Rose mine on Peak 10, of the Ten Mile range south of Breckenridge, will be worked within the next 60 days. This property was bought last fall by the South-Western Brokerage & Investment Co. of Memphis, Tenn. This property carries high-grade silver ore and will be added to the shippers' list.

William H. Baker, general manager of the Gold Pan Co. and other officers of the staff in Breckenridge, have returned from Denver, where they met in consultation with the financial branch of the company and report that the Gold Pan is to be worked this year on a large scale.

T. A. Brown, of Breckenridge, has leased the Leona, Edna and Lone Bug claims on Nigger Hill to Condon and Shoock who are already working several other paying leases in this camp. The Rochester group on Bald mountain, comprising Rochester, New York and Buffalo claims, has been bonded to an eastern syndicate and work will be started within 30 days.

The spring thaw is making it difficult to haul ore, and the condition of the roads is causing many properties to cease shipping and consequently a large reserve of ore is now piled on several properties. The Bullion King, on Gibson Hill, has 150 to 200 tons high-grade zinc ore in pile, and by the time the roads are in condition to haul, this quantity will be doubled. The Sallie Barber, on Nigger Hill, has a batch of 40 or 50 tons high-grade zinc ore ready for transportation. The Country Boy mine also has a considerable pile of 40% or better zinc ore ready for shipping and has in the workings a three-foot ledge of ore of the same quality. The Wellington mine is making regular shipments of lead and zinc ores of good grade for smelting and is now hauling the lower grade to the Old Union Mining Co's. mill to be concentrated. The Old Union mill is now running continuously on its own and Wellington ore.

A good strike of high-grade zinc ore assaying 41% zinc has been made in the main tunnel on the Old Union vein underneath the Montgomery shaft. The ledge is over two feet wide. Condon and Shrock are now working their new lease on the Edna and Leona group, on Nigger Hill, and are taking out a good grade of gold ore. This is oxidized ore and is free milling, averaging in value from $60 to $80 per ton. The Reliance gold dredge in French gulch is running full speed day and night and great returns are looked for from the rich channel known to exist at the junction of French and Nigger gulches. The management has been added to at the Lucky mine. Mr. S. H. Dunlap has been installed as manager and will devote all of his attention to this property. George E. Moon is still in charge of the work and has put on an extra force of miners. The Baird brothers are doing good work on their lease at the Dunkin mine, on Nigger Hill, and while developing are taking out some good silver-lead ore carrying gold. It is reported that work will shortly be resumed on the Finding deep shaft. The Mountain Pride mine in Illinois gulch is to resume operations and a tunnel started to tap the main ledge of the property, which during its last term of working produced at the rate of 2,000 per month from the shaft. The Knorr group in Summit gulch is to be worked again during spring and summer and will be started on the first of May. Colonel Lemuel Kingsbury, general manager of the Summit Banner Placer Mining Co. in Breckenridge and of the Buffalo Placer Mining Co. at Dillon, has returned to Breckenridge from the East and is making preparations to start up operations at both properties as soon as possible.

Breckinbridge, May 6.

TELLER COUNTY.

A strike is said to have been made on the Jack G. claim, of the Doctor-Jack Pot Consolidated, on Raven Hill, in a 40-ft. shaft. A streak of ore, 6 in. wide runs five to six ounces per ton.

A strike is reported by the lessees operating on School Section No. 8, known as the Montague lease. A vein carrying from three to five ounces gold was encountered in the shaft during the course of sinking. The vein which was cut at a depth of 625 ft. is from two to three feet in width. This lease has produced a great deal of good ore and has paid handsome royalties into the State treasury. Two cars are being sent out each month by John Best, operating the Jefferson claim. The mineral runs $40 gold per ton. Best is breaking ore two feet wide at a depth of 300 feet.

A lease has been granted to Ralph and Charles Beaman, of Goldfield, on the dump of the American Eagle of the Stratton Estate, and the lessees will begin active operation at once.

Morrell and Butler, leasing on the Accident claim, on the west slope of Gold Hill, have opened 18 in. of ore that gives returns $50 gold per ton. Regular shipments are expected from the property.

NEVADA.

CHURCHILL COUNTY

A new gold strike of importance is reported on a claim at Fairview, and the rush already on to the new camp, has been greatly increased. The strike was made on the property owned by Kerby, Davis, Webber and Hodson. While working on the principal claim of a group, miners uncovered an 18 inch streak of ore going $3600 gold per ton. This streak is in a ledge five feet wide.

NYE COUNTY.

Determined to stop the practice of claim jumping popular with many in the rush to the Nevada gold fields, 200 citizens pressed their way into the merchandise store and saloon conducted by W. A. Gray in Rhyolite on the 15th inst. and demanded that he remove his monuments and destroy his location notices on the Salt Lake, Buffalo and other claims, in the vicinity of the town of Rhyolite. The mob gave no warning of their intentions till Gray was met. For a moment he hesitated to give an answer to their demands; then made a flat refusal. The miners took him in hand and jostled him from one to another until the street was reached. Gray was treated in a manner that soon caused him to agree to the demands of the crowd. Accompanied by his two sons he was escorted to the property in dispute, and the mob saw to it that every trace of the Gray adverse claims was removed before they released him. He was warned that a repetition of the offense would mean something more serious than the experience through which he had passed. Gray's explanation that his action in staking these claims followed legal advice did not satisfy the crowd, and they refused to accept his protestations of innocence.

Three months ago Manhattan had only a dozen tents and not more than a score of people. Today it is a bustling city of 1500 tents and houses, and a population of more than three thousand. Japs and Chinese are excluded by the labor unions, which control the wage scale, and wages are good. Cooks receive $7 per day; waiters $4 and board; bar tenders $7; miners $4.50 and $5; blacksmiths $8; laborers $4.50. The cheapest living to be had costs from $60 to $75 per month, but by buying a tent and "batching" one can live for less. Wood is plentiful and can be had at $6 per cord; water for $1.50 per gallon. Good water is reached at from 40 to 60 ft. depth. Ordinary lumber costs from $75 to $90 per thousand. Lots on the main business street range in price from $500 to $5,000 and ground rents from $50 to $200 per lot. An office room centrally located, brings from $50 to $75 per month—just one. One or two room cabins rent from $25 to $40 per month. Rents for small business houses range from $150 to $600.

Few of the mine owners have done anything more than the ordinary assessment work, and therefore little of the district has been developed.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence.)—As the result of an action to foreclose a mortgage for $60,000 against the Mountain Lion mine and mill, Judge Whitson has handed down a decision in the U. S. Circuit Court at Spokane, Wash., in favor of Albert McLaren against the Mountain Lion Gold Mining Company and awards the complainant a decree for principal, interest, costs, attorney's fees and taxes paid on the property under mortgage. The defendant resisted the foreclosure on the following grounds: That on Aug. 18, 1903, the defendant executed a note for $60,000 payable on demand; that subsequently the board of directors of the defendant company passed a resolution authorizing the taking up and cancelling that note and the execution of a new note, together with a mortgage on the company's mine and mill at Republic camp, to secure its payment. That was not done, but instead, a mortgage was given to secure payment of the original note. The specific grounds of defence were that there was no authority for giving the mortgage, inasmuch that it was not in pursuance of the resolution of the board of directors; that there was no consideration for the company and that the company was insolvent at the time the mortgage was given. The ground was taken that the complainant did not hold the note at the time the mortgage was given, but had endorsed it to the Bank of Montreal. The officers of that bank had testified that they looked to Mr. McLaren for the payment of the note and that he had subsequently taken it up and brought suit to foreclose. The Court held that while there was no express authority by the board of directors for executing the mortgage, yet there was authority for securing the debt, and that it subsequently came to the knowledge of the directors that the mortgage was given, and with such knowledge they had permitted the complainant to rely thereon for over eighteen months in place of repudiating the action of the directors. The Court also found with the complainant that at the time the note was executed and the money advanced it was agreed that the mortgage should be given and that this constituted a sufficient consideration. The Court further held that there was not sufficient evidence of insolvency.

During the last operation of the mine at least 38 carloads of ore were shipped to the smelters, and a considerable lot treated at the mill. It is generally supposed that the agents of the company who contracted the debts, have received sufficient money from the ore treated to, at least, pay the debts contracted on the last run, but they have not yet shown any disposition to settle them, or pay anything. The laborers and some others who furnished supplies have already filed liens. The mine is considered one of the best in the camp, and it is possible that the lien holders may go into court and ask that a receiver be appointed. In the light of events some doubt has arisen as to the success of the concentrating tests at the mill, but those who conducted them say that they have money to put up for the purchase of machinery to treat the ore, if they can get a lease of the mine.

The Quilp mine, after shipping a thousand tons of ore under contract, has closed down for want of a market for more.

At the Pearl Consolidated, by raise and winze, connection has been made between the lower tunnel and bottom levels, and new stopes are being opened. Only three carloads of ore have been shipped during the past week, but the quantity may be increased. Wm. M. Crummer has resigned the superintendency and A. C Cook has been appointed in his place. The installation of new machinery and surface improvements having been completed, the working force has been reduced to 12 men, and the company now hopes to make the mine self supporting and no more assessments will be levied, if possible to avoid it.

At the Copper Key mine ore was struck 20 ft. above No. 2 tunnel level in considerable quantity, and the raise has gone up in it 20 ft. or more. The strike was made on a contact of trachyte and dolomite. This ore runs $20 gold per ton, and carries a small percentage of copper. The working force has been increased by putting on a night shift.

A drift is being driven from No. 2 crosscut, along the hanging wall on the west side tunnel level of the Oversight mine. The crosscut tunnel on the east side has been driven to the vein where there is now considerable shipping ore in sight. A 200-ton ore bin is being constructed in anticipation of transportation facilities near at hand.

The Anonymous tunnel is reported to be in 190 ft. and a stringer of good ore encountered. It is expected to cut the main vein at a depth of about 250 feet.

The Belcher mine is employing 12 men, with one large and one small electric drill in commission, and a raise is in progress between the third and second tunnel levels.

The rolling stock of the Belcher Mountain Railway has been removed from the Washington & Great Northern track to the Belcher Mountain switchback and tracklaying is about to be started.

Meteor camp, on the south half of the Colville Indian reservation, is unusually active, according to a mining man from there. Work has been resumed on the Horseshoe mine. On the New York mine a drift has been driven 150 ft. on a good quality of ore.

The tunnel on the Nonpariel is in nearly 800 ft. and it is believed to be close to the main ledge. It has already crossed two blind veins, the ore from which assayed from $25 to $600 per ton, gold and silver.

A tunnel is being driven from Stray Dog canyon for the Raspberry group which is in about 160 ft. and has intersected a good vein of gold and silver ore.

The Orion Mining Co. is driving a tunnel on a fine group of claims and expects to put it in 1000 ft. or more. It is now in about 600 ft. Eight men are employed. This company has located 1,180 acres of land on the Columbia river, as placer, and intends laying out a townsite. It has commenced building a wagon road from its mines in Stray Dog canyon to the river and has planned the establishment of a ferry across the river, with a view of building a road on the Stevens county side to the Spokane Falls and Northern railway, at Orient.

The Blue Bell Belcher Mining Co. has filed articles of incorporation with Charles S. Voorhees, R. A. Hutchinson, E. C. Grove, George Foster and C. E. Mitchell of Spokane, Wash., as trustees. The object of the company is to acquire and operate the Blue Bell group of claims on Belcher Mountain, believed to cover 3,000 ft. of the Belcher vein, northeast of the Belcher mine. The Blue Bell people claim their boundary to be only 75 ft. from where the Belcher company is now working.

The Washington & Great Northern Railway Co. has ordered 50 new steel 50-ton, self-dumping ore cars for the transportation of ore from the mines of Republic camp and the Belcher mountain neighborhood.

The Keller and Indiana Consolidated Smelting & Development Co. states that its smelter at Keller will be completed about May, 1906.

The Orion Mining Co. is planning for the installation of a concentrating plant at its mines in Meteor camp, Ferry county, Wash.

Republic, May 3.

BRITISH COLUMBIA.

YALE DISTRICT.

Following are the ore shipments of the Boundary mines, in tons, for the week ending May 5: Granby mines, Phoenix, 15,027; B. C. Copper Co., Mother Lode, Deadwood, 3,232; Dominion Copper Co., Brooklyn-Stemwinder, Phoenix, 3,201; Rawhide, Phoenix, 297; Sunset, Deadwood, 858; Emma, Summit, 502; Providence, Providence, 60; total tons, 23,177.

Smelter treatment for the week was: Granby Co., 15,032; B. C. Copper Co., 3,573; Dominion Copper Co., 4,422, total for week, 23,027.

The April output from the mines of Boundary district holds up the 1906 average notwithstanding that the Granby Co. has been running light, owing to repairs and enlargements going on. During the month the mines sent out 107,000 tons. Since the first of the year the tonnage output has been as follows: January, 104,378; February, 105,429; March, 112,638; April, 107,798; total for four months, 430,243.

Granby's output for April was 68,503 tons; B. C. Copper Co., output, 17,668 tons. This smelter must close in a short time for extensive enlargements. The Dominion Copper Co. output for April was 20,000 tons. The several mines shipped ore in April as follows: Granby Co., 68,503 tons; B. C. Copper, Mother Lode 17,668, Emma 1,360, Dominion Copper, Brooklyn-Stemwinder 14,622, Rawhide 1,049, Sunset 4,331, Rambler 35, Strathmore 80, Preston 20, Providence 60, Skylark 70; April total, 107,798.

Notices of Recent Patents.

Dewey, Strong & Co. have offices at 10 Bacon Block, Oakland.

Among the patents recently obtained througr Dewey, Strong & Co.'s Scientific Press, United States & Foreign Patent Agency, the following are worthy of special mention:

CHECK-BACK ATTACHMENT AND CLAMPS FOR TEAMS, No. 818,792. April 24, 1906. Theodore Schmeiser, Davisville, Cal.

This invention relates to a device which is designed for attachment for teams of horses for the purpose of checking such horses in teams as are inclined to travel too freely and to thus equalize the pull of the entire team. This device consists of the combination with a check-rein of a U-shaped clamp adapted to fit and inclose the bight of the check-rein, a screw-shank passing through the sides of the clamp and the rein, said screw having an open loop or head, a single rein having one end attached to said loop and the other extending diagonally rearward and connected to a portion of the draft apparatus.

PILE AND LIKE CLAMPS, No. 818,794. April 24, 1906, Phil Sheridan, Berkeley, Cal.

The object of this invention is to provide a means for steadying and guiding piles, and particularly hollow piles which are built up of staves and of larger diameter, running from three to five feet. The device comprises pivoted horizontally opening and closing clamping timbers having concaved faces adapted to fit about the sides of the pile, metal strips forming shoes for the concavities of the clamps, said strips having their contact faces made convexed in vertical section and pivoted pawls or stops having notches adapted to engage the outer edges of the clamps between the timbers to hold them in position.

SAWING MACHINE, No. 817,628. April 10, 1906. J. A. Cumminskey, Cloverdale, Cal.

This invention relates to an improved machine for sawing wood into suitable lengths and sizes for burning in stoves, furnaces and the like. The object of the invention is to provide a simple, practical, portable machine of large capacity which can be moved readily from place to place and be ready for work at an instant's notice, and which can take logs or poles of any length up to two feet, more or less, in diameter, cut them to the proper lengths, and, if desired, convey the lengths to splitting devices, and which splitting devices are operated from the same source of power used to drive the saw.

APPARATUS FOR MOLDING GLASS ARTICLES, No. 817,576. April 10, 1906. F. J. Mackin, San Francisco, Cal. Two-thirds assigned to Illinois-Pacific Glass Company of San Francisco, Cal., a corporation of California.

This invention relates to an apparatus for molding glass articles, and especially hollow articles, such as jars, bottles and the like. It consists in the combination of pivoted mold-sections, a slotted support therefore, means for shifting the pivot of the mold-sections co-ordinately with the opening of the mold, a slotted disk, projections on the mold-sections engaging the slots in said support and disk, the slots and the support and disk co-operating with said projections to open or close the mold-sections on the operation of the disk, and means for operating the disk, said slots arranged so that one mold-section is given an initial opening movement in advance of another; and other details of construction.

FRUIT PACKING DEVICE, No. 818,812. April 24, 1906. F. K. Bartholomew, Campbell, Cal.

This invention relates to a device for packing prunes and other dried fruits. It comprises in a device for packing dried fruit, a main box or former having one open side, a false bottom and side fitting the main box and completing its outline, a frame substantially fitting the top of the main box having downwardly-extending flange fitting over and temporarily locking the supplemental side and bottom in place, and means by which the fruit with which the structure is filled is compressed into the main box.

Books Received.

The Missouri State Bureau of Geology and Mines has issued Vol. IV of the 2nd Series, on the Geology of the Granby area, by E. R. Buckley and H. A. Buehler. This is a careful study of the zinc-lead field of the Granby area, in Newton county, which lies south of the better known Jasper county in which is the Joplin field. The area in question is 16 miles southeast of Joplin. The publication is handsomely illustrated and contains much valuable information for those interested in the mining of zinc and lead. E. R. Buckley, State Geologist, Jefferson City, Mo.

Commercial Paragraphs.

The temporary San Francisco agency of the Sullivan Machinery Co. is located at 1010 Washington St., Oakland.

J. N. McLeod, assayer and chemist, has moved his offices to 1734 Glenarm St., from 1747 Lawrence St., Denver, Colorado.

The Lunkenheimer Co., of Cincinnati, Ohio, one of the largest manufacturers of high-grade engineering specialties in the world, have on May 1, 1906, opened a well-equipped branch store at 66-68 Fulton St., New York.

The National Wood Pipe Co. announce that their factory at 6th & Channel St., San Francisco, was but slightly damaged and they will commence work again as soon as authorities will allow them to fire-up their boilers.

The Samson Mfg. Co., Denver, Colo., have received orders through Fairbanks, Morse & Co., Denver, Colo., for ten Samson crushers for shipment into Boulder county, Colo. The crushers are being manufactured by McFarlane & Co.

J. W. Duntley, president Chicago Pneumatic Tool Co., sailed for Europe on May 3 in the interest of the company's business. Several contracts are reported by the Consolidated Pneumatic Tool Company, Ltd., London, a foreign branch of the Chicago company.

Announcement is made of the opening of a branch office in Columbus, Ohio, by the Power & Mining Machinery Co., Milwaukee, Wis., in Rooms 700 and 701 Columbus Savings & Trust Bdg., with William A. Heartt in charge as district manager.

The Power & Mining Machinery Co., Milwaukee, Wis., report having recently closed contracts for their Loomis-Pettibone gas generating plants for an aggregate of approximately 12,000 horse-power. Over 150,000 h. p. capacity of Loomis-Pettibone plants have been installed, and are now in operation in this and foreign countries.

Abner Doble Co., with temporary offices, 2611 Broadway, Oakland, Cal., announce that they have now under construction large and new permanent shops and warehouses at Seventh and South streets, in the Potrero district, San Francisco. By May 15 they expect that part of their manufacturing establishment will be running full force, and within a very few weeks the entire plant will be in complete operation.

The Colorado Iron Works Company reports the following shipments of milling and smelting equipment: Ross M. & M. Co., Silverton, Colo. 12 mounted slag cars, one combination trap-spout for smelter; S. S. Fowler, Nelson, B. C., Simplex table; St. Joe Lead Co., Bonne Terre, Missouri, four pneumatic ore gates; Boise Gas Light Co., Boise, Idaho, three impact screens; American Smelters Securities Co., laboratory crushing rolls for Matehuala, La Paz, Mexico; Federal Mining & Smelting Co., Wallace, Idaho, set of 27 by 14 in. Humphrey rolls; five dome-top, ball-bearing turntables for Japan; Arizona-Mexican Mining & Smelting Co., Needles, California, one three compartment set jigs.

Latest Market Reports.

Anglo-American Shares.
Cabled from London.

	May 3. £ s d	May 10. £ s d
Camp Bird	1 4 0	1 2 3
El Oro	1 5 0	1 5 6
Esperanza	3 18 9	3 16 6
Dolores	1 18 9	1 18 9
Oroville Dredging	0 17 6	0 17 6
Stratton's Independence	0 7 0	0 7 6
Tomboy	1 6 9	1 6 9

(By courtesy of W. P. Bonbright & Co., New York.)

METAL PRICES.
By wire from New York.

Average prices week ending:	May 3.	May 10.
Lake	$18.62@$18.75	$18.62@$18.75
Electrolytic	$18.25@$18.50	$18.25@$18.50
Casting	$18.00@$18.25	$18.00@$18.25
Lead	$ 5.50	$ 5.60
Spelter	$ 6.05@$ 6.10	$ 6.00@$ 6.06
Silver	$ 0.66	$ 0.67

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EDITORIAL.

THE NINETY-FIRST MEETING of the American Institute of Mining Engineers is to be held at London, beginning on July 23. An attractive program has been announced by the Secretary, Dr. R. W. Raymond, and it appears likely that a number of American engineers will take the opportunity of visiting English mines and metallurgical establishments.

THE FRIENDS of subscribers in San Francisco will confer a favor on them, and on us, by telling them to forward their new addresses to our mailing department. Owing to the postal regulations, undelivered second-class matter is held for forwarding postage; and although we have written to each subscriber, it is likely that many of them will not get our notification at this time.

OUR OFFICES at New York, Chicago, and Denver have been improved so that our representatives at these centers are now in a position to welcome visiting professional men. We shall be glad if our friends will make themselves known to our representatives—all of whom acted with exemplary spirit during the brief time of confusion caused by the destruction of our central office. We take this opportunity of stating that the Boston agency has been transferred to our New York manager.

IN OUR LAST issue we referred to the fact that one of the great miners, George Lansell, had passed across that range from which no prospector ever returns. Through the 'Bendigo Advertiser,' we learn that in his will he bequeathed a gift of mine shares, in terms of money according to the current market quotation, to each of his managers and also to every miner, laborer and boy employed on his own properties. He also left $50 to every one of the pioneers who were with him at Bendigo in 1857; of these there are 90 that survive. These remembrances are characteristic of the kindly heart of the Bendigo "Quartz King," as he was fondly called throughout Australia.

THE DAILY PRESS states that the wife of ex-Governor James Budd has foretold another catastrophe and it is claimed that she predicted the recent disturbance. Such statements after the event are not uncommon; so many people foretell things and they foretell so many different things that like the shot from a "scatter gun" something is sure to be hit. It appears that despite her belief in an impending cataclysm, the lady in question bought a $1500 piano two days before April 18. We are informed that the lady possesses a private observatory, for she uses a strong glass whereby she "keeps tab on the peculiar antics of several stars" that have stayed up late and otherwise misbehaved. As to the "strong glass,"—that is a fruitful stimulant to soothsaying; but we want to know whether it was Scotch or Bourbon.

THE DAYS OF SOOTHSAYERS are evidently numbered; the time was when prophesies of disaster, especially such as emanated from elderly ladies, were calculated to create a panic. There was Mother Shipton who scared the ignorant in the year 1881 and now there is this Mrs. Budd in California who has predicted fearful things. All the daily papers quote her, so it must necessarily be true. But the spread of an elementary knowledge of natural phenomena has given men the chance to think intelligently on these matters and no foolish talk will now distress the general run of people as it used to do twenty-five years ago. The good sense and the recovery from disaster so noteworthy in our midst during the past four weeks, are to be credited to the spread of scientific knowledge—enough of it at least to give mental balance even when the earth reels and the skies seem afire.

IN A RECENT ISSUE we referred to the fact that, as far as known, no mine in California has suffered injury underground from the earthquake. It appears that this holds true of the oil-wells although the casings of deep artesian water-wells in the Santa Clara valley suffered fracture. There were a few breaks in the pipe-lines of the Coalinga district, but these were quickly repaired and entailed only slight loss of oil. There were minor breaks also between Coalinga and Monterey, and near Salinas, but there was no damage to the wells themselves. The oil production of the State is about 20,000,000 barrels per annum, worth about $6,000,000 at the wells and costing the consumer a dollar per barrel. As this product of the State has proved an important factor in lessening the cost of fuel necessary for generating power in our manufacturing industries, the preservation of the oil-wells and pipe-lines is gratifying news.

JUSTICE is proverbially slow, and in none of her departments is she so leisurely as in the meting of punishment to dishonest mine promoters. Therefore it is satisfactory to chronicle the consignment of G. W. Rumble to the jail at San Quentin. He is to remain there for a year and a half, having been convicted of fraud in connection with the Sunset Mining Company. To the postal authorities is due the credit for this conviction and while the misuse of the mails is difficult to prove, it appears that prosecution by the Government is at present the only effective check on fraudulent mining schemes. In connection with this episode, it is interesting to note in one of our daily papers the statement that Rumble went to Washington last week "to the great wor riment of his bondsmen, for the purpose of inducing the President to intercede in his behalf." A man possessed of such unlimited impudence might well occupy himself with the sale of worthless mines, for if ever there was a man who would be likely adequately to condemn such mean methods and pitiful knavery, it is the Chief Executive of the United States.

IN REGARD TO the misuse of dynamite during the conflagration in San Francisco and the blasting operations afterward, we have received several letters endorsing the criticism appearing in these columns two weeks ago. Mr. Frank A. Leach, the superintendent of the Mint, informs us that he offered to supply the services of experienced men, but the individuals doing the blasting claimed that they understood the use of explosives in demolishing buildings better than any miners. Mr. Leach now possesses a piece of iron weighing a quarter of a pound that landed in the court of the Mint when a blast was fired in the Phelan building several blocks away. Other similar pleasant projectiles were hurled to the same spot from other blasts far away. In contrast to the foolish doings of the amateur miners, we quote an instance of the intelligent—and therefore safe—use of explosives in removing masonry. When electric power was installed at the Mint in place of steam and the 150-horsepower engine, which was placed on the main floor of the building, was removed, the huge foundation of brick-work laid in cement, which filled the space in the basement underneath, was useless, and, room being needed, the superintendent concluded to remove it. It was a solid mass about 30 feet

long, nearly 20 feet wide, and 12 feet high. Mr. Leach put some men at work with picks, gads and hammers, but they made so little headway that it began to appear a hopeless task, when one of the Mint employees, Andrew Cuneo, came along and said that if Mr. Leach would allow him to use dynamite he could guarantee to tear the foundation down in good time. He was asked if he was sure he would not damage the building. He replied by saying that he would not only not damage the building, but would not break a pane of glass of the three windows situated not more than six feet away. He was allowed to proceed with the undertaking, and fulfilled all his assertions. This story confirms what we have said, that dynamite is a safe and wonderfully effective agency in experienced hands, and it needs no further remark from us to emphasize the inefficiency and danger of powerful explosives when employed by the inexperienced.

California's Opportunity.

The destruction of San Francisco is a calamity of such magnitude that few realize the problems which reconstruction involves. Fully seven square miles of the best and most substantially built portion of the city is destroyed. Here and there stand buildings practically uninjured—constructed of steel, brick, and stone,—but by far the greater portion of this area, say about 95%, is a vast ruin marked by foundations, fragments of walls, and tottering chimneys, with occasionally a tangled mass of steel, iron and earthy structural material. It has been determined, once and for all, which material best resists the terrific heat of a general conflagration. Granite structures, or such portions of buildings as were built of granite, spawled or crumbled under the blast, until the stone looks now as if it had been subjected to the action of weathering influences for centuries. Square blocks of granite were reduced to rounded boulder-like forms, their outer portions crumbling to coarse sand. Marble pillars were quickly converted into caustic lime. Even sandstone ordinarily well suited to withstand fire, cracked and crumbled before the fiery blast. Steel and iron were warped or bent, and in some instances they were even melted. Nothing resisted the intense heat but good brick. This is no new experience. Chicago, Boston, Baltimore and other cities that have been devastated by fire, all have proved that nothing better withstands the advance of a conflagration than a solid dead wall of red brick. There were many substantial buildings of steel, brick, stone and tiling in the burned district; they were supposed to be fireproof, but in several instances these were scattered singly among blocks of frame structures the burning of which created a heat so fierce that even those materials ordinarily considered noncombustible, and proof against fire, went down before it, as though charged into a blast furnace.

What of the future? Without the slightest hesitation, the men of San Francisco have decided that the city shall be rebuilt; and it will be, as fast as the material can be supplied. The city must be made safe not only against earthquake shock, but against the possibility of another great fire. It has been shown that a proper regard for solidity of construction in both foundations and superstructure, with the employment of good materials and honest work, will withstand the effect of earthquakes even of a severity as great as that of April 18. Little damage was done to the Federal buildings in San Francisco, for these were honestly constructed of first-class material, while more showy but less substantial structures were severely damaged. The walls of one building, for example, on Haight and Webster streets, though solidly built of stone, prove to be little better than a pile of loosely cemented rubble, neatly pointed on the outside. Large portions of such so-called stone walls were destroyed. The Palace Hotel, though not strictly modern, was solidly built of brick with many interior walls and partitions. The damage to this building was due almost wholly to fire, proving that brick structures, even with much less steel than is used in modern buildings, are practically proof against earthquakes, but not against the effect of acres of fiercely flaming wooden structures amid which they may be situated.

San Francisco must be rebuilt substantially. The proper materials for construction are steel, iron, brick and stone. Upon these points all are agreed, but the most serious problem is to secure sufficient material to carry on the work promptly. There is no lack of energy and determination to rebuild, and there will be no shortage of money for the purpose; but whence can the materials be obtained with reasonable promptitude?

Naturally the East is expected to supply the steel and iron; California alone is able to provide much, if not all, of the brick, terra-cotta, and stone; while California, Oregon and Washington will furnish the lumber. Lumber is the most readily obtainable, and this fact may again lead to the use of too large an amount of inflammable stuff. Much of the brick from the destroyed buildings can be cleaned and used again; indeed, this must be done from necessity, for otherwise it would take too long to make the quantity required; as it is, the brick-yards and terra-cotta works of California and neighboring States will have to run at their fullest capacity for years to supply the demand from San Francisco alone.

The most serious problem is how to secure the necessary steel and iron as fast as wanted. Every mill in the East that makes structural shapes is said to be from one to two years behind on its orders. Even before the fire it was difficult to get steel fast enough to continue steadily the construction of large buildings. Here is the real obstacle. Reconstruction cannot proceed without steel and iron in large quantities. If the East cannot supply what is required, the remedy is plain. The necessary structural steel must be made on the Pacific coast. It is well known that large deposits of iron ore are available. Heretofore it has been argued that the time had not arrived when local iron furnaces and rolling mills could compete successfully with those in the East. The present situation upsets such an argument. The iron mines of California, Oregon, Washington, Alaska, Utah and Mexico can supply the ore; a great and permanent industry may now safely be established here. Several methods of producing iron are available; the ordinary blast-furnace practice of the East; the making of blooms in reverberatories, oil being employed as fuel; furthermore, the advocates of the electric furnace have a grand opportunity, and the same may be said of the enthusiasts who have written so much about the value of the iron sand of this Coast as raw material for the manufacture of iron. Now is the time to prove it! Heretofore the main drawback to the founding of a steel industry was the lack of a local market; that market has been created suddenly; a great opportunity has arrived. The iron ore is here and can be made accessible; California produces 20,000,000 barrels of crude petroleum annually; therefore a cheap fuel is available. Why should not San Francisco make her own structural steel?

By the Way.

The London 'Spectator,' the paper rendered illustrious by Addison and Steele, founded 150 years before San Francisco existed, has this to say of our misfortune: The dominant note of the news from San Francisco has been one of unconquerable optimism.

The salient fact is the immediate decision to rebuild, to resume again the ordinary routine of life as soon as human effort can make it possible, upon the same spot, under the same skies, on the very foundations even which lie with their superstructures in dust above them. Is it reasoned decision, or mere impulse, which underlies that sudden determination? If there is reasoning, it would seem to be that what has only happened once will not happen again. The earthquake of 1868, in the words of one of the sufferers, "was nothing more than the rocking of a child's cradle," as compared with the earthquake of 1906. "There is no record of a great city having been twice destroyed by convulsion or eruption; the earth will not heave again, or, if it does, it will be at a time so distant that the contingency need not be considered." And so the plans go forward. If all the arguments are pressed home, the outstanding conclusion must be the essential sanity of the decision which determines upon reconstruction in the face of all hazards. For what are the alternatives? in which direction is safety to be sought? Away from the latitudes in which earthquakes tear down cities? But can those latitudes be limited? For, remember, the knowledge possessed by man of the causes of earthquakes is, and will possibly always remain, extremely small. All that can be said to be known, that is, apparently rightly reasoned from certain premises, is that the planet on which we live has cooled down from a glowing mass of molten matter, and is still cooling; that during the lapse of unnumbered and innumerable aeons the almost cold crust has clothed itself with the power of giving and supporting life; and that of all living beings it has been ordained that man alone shall be able to understand and reason about the vast laws of his existence. He is allowed to build huge cities where he pleases, to carve the thin stone under him to pile up palaces a hundred feet high, with more than forty million feet of unknowable matter between him and his fellow palace-builder the other side of the globe. Beneath the ground he treads, it may be but one short mile away, huge forces wake and sleep, move and are still; some unseen power shifts uneasily, writhes and rolls, and the caked coating above quakes as a bog-crust might shiver over a buried bull. Under which spot of all the surface over which he may roam will the monster writhe next? He cannot tell that; he knows only that here and there, during the few hundred years of which he has record, may be found tracts of land which hitherto have not been shaken, or have been shaken only slightly. What he does not know is whether the same laws which have hitherto prevailed can be counted on to prevail for the future. And if he does not know that—if, that is, he cannot stamp his foot on a square yard of ground and say, "Here at least it is certain that the earth will never be riven," is it not just as sane to rebuild where buildings have been shattered as to build afresh where no buildings have stood?

The builder will face that risk in his own way. He may watch his houses overwhelmed by the resistless march of lava, and with easy fatalism the next day sip wine over their ruins. Or, with the alert sanity of a nation buoyant in her belief in her mission of work, he may set himself with steady energy to make better what was good before, to use his broken buildings to teach himself lessons of knitting more soundly stone and steel and wood, to set together a new city, greater, compacter, and cleaner than the old. That is the task which has been set the San Franciscans by the genius of the great nation to which they belong. It is the genius of the American nation to grasp essential points, to rise greater than calamities, as though calamities gave wings or spurs; the greater the need for decision and courage, the greater capacity emerges for bravery and action. The descendant of the colonists who faced a new world with fresh thought and untired arms, in the crash of misfortune

"Turns his keen, untroubled face
Home to the instant need of things."

With the deep sympathy that has been felt by the English-speaking race for the sufferers in the ordeal of the last ten days there is yet mixed a high pride in the recognition of the qualities of cool steadfastness, courage, and strength which have nerved those who have sustained the greatest losses, and which are admired above and beyond other great and abiding qualities by their kinsmen.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

The ankerite masses occurring in the Mother Lode region of California are auriferous in many places, but are usually low grade. A notable exception was that in the Rawhide mine, near Jamestown, Tuolumne county.

Franklinite is a zinc-bearing iron ore, which also contains manganese. Treated with hydrochloric acid, a small amount of free chlorine is evolved. Zinc-blende, when treated with hydrochloric acid evolves sulphureted hydrogen.

The copper ore of La Sal District, on the border line of Colorado and Utah, is mostly found in sandstone The Uranium ore, for which that district is noted, occurs in the same formation, but principally in fissures cutting those rocks.

One acre-foot of storage will produce a flow of 30 cu. ft. per min. for 24 hours, or 20 miner's inches. Conversely, a storage capacity of four acre-feet is needed to give a 24-hour flow of 100 cu. ft.; or for 100 miner's inches, six acre-feet.

When drilling in sandstone the drill-bit should be tapered somewhat and then flattened instead of drawn to a cutting edge. If a chisel-bit is used in drilling sandstone the bit will wear very sharp, and will frequently become fitchered.

In the moderately humid Eastern States the annual evaporation from reservoirs is from three to four feet. Accurate data for the dry States is lacking, but probably double these figures would be a minimum. Accordingly, where existing lakes are to be used for storage, it is in general better to lower the outlet than to raise the level.

As to the effect of vibration from stamps on a mill building, if the battery foundations and those of the mill structure be properly built, a brick building would be as serviceable as one of wood, and would also be less likely to take fire. Brick mills have been in use for thirty years or more in South Dakota and Colorado, and have proved satisfactory.

For stopping the joints between slates (or shingles) and chimneys, dormer windows, etc., a mixture of the keg paint with sand enough to keep it from running is very good, especially if protected by a covering of a sheet-lead strip nailed to the mortar joints of the brick work after having been bent to enter those joints, which should be scraped out to the depth of one inch and then re-filled.

The earthquake which visited the Pacific Coast on April 18 teaches many valuable lessons in planning building construction. Two things are plainly evident: First; frail stone, brick and other flimsy buildings cannot withstand the shock. Second; properly constructed buildings on massive foundations of sound materials are practically immune from shocks of earthquake even as violent as that lately experienced.

If a tunnel is to be run to open an ore deposit in depth, it should, where possible, be driven on the vein rather than through barren country rock to reach it Often the topographical situation has an important bearing on this matter, particularly with reference to the position of mills or other reduction works. Tunnels run on the vein always prospect the deposit, and there is far better chance of striking a pay-shoot in such tunnel than in one run across the formation.

The price of platinum per ounce now exceeds that of gold. It therefore behooves the placer miners who can save it, to spare no pains so to do. Placers, the streams of which head up in areas of serpentine are the ones most likely to contain it, since platinum shows a strange fondness for the highly magnesian rocks and is seldom found in other surroundings. A very common associate with it is chromite. If the nuggets have not been washed far, chromite may even still adhere to them.

Jigging is a process of concentration which has been in use for many years. Jigs are of many types and sizes, from simple, hand-operated devices of small capacity, up to large machines run by power and treating several hundred tons daily. Jigging is applicable to the treatment of ores of any kind that are subject to concentration. Jigs are particularly useful in treating rather coarse products though they are also successfully employed in the concentration of the fine material passing through the upper screen, or that resulting from re-crushing the oversize ore from the coarser screens. Seveal minerals of varying specific gravity may be separated by careful jigging, as galena, pyrite, blende and quartz. Coarse jigs can be employed to concentrate lump ore, those lumps still having gangue mineral attached being separated from the clean ore, and returned to the crushing machine for reduction to smaller size, and re-construction.

Chemically pure iron is soft, malleable and easily welded. It cannot be hardened or tempered, as these terms are understood in relation to steel. In contact with a magnet, it becomes magnetic, but loses this property when the magnet is removed. It is unfitted for castings on account of its lack of fluidity. Those properties of iron which render it valuable as a commercial product must, therefore, be primarily due to foreign substances in the iron; and the great variety of these properties is attained by changes in the amount and nature of these impurities, and by the physical treatment of the iron while it contains them.

Enrichment.—If there are oxide and carbonate copper ores at and near the surface, and the tunnel cutting the vein at a depth of 700 ft. is wholly in sulphide ore (chalcopyrite) it is possible that a zone of enriched sulphides—bornite and glance, may be found in the intermediate section. It is impossible to tell to what depth oxidation or partial alteration of an ore deposit has progressed, or what conditions may be encountered, until these have been determined by actual development. No mining region proves this more completely than that of Butte, Montana, where surprises in ore occurrence are frequent.

Paint. The principal materials used in house painting are either white lead (containing 80% lead) or oxide of zinc (zinc white) ground in raw, that is unboiled, linseed oil by a grinding mill to the consistency of a thick paste, containing 10% oil. In this condition it is sold in kegs of 25, 50 and 100 lb. For use this is thinned down by mixing in for each 10 lb. about three or four pints more of linseed oil, when it should flow readily under the brush. When, as is usual, raw oil is added, dryers must be added, otherwise it might take several weeks for the paint to harden, whereas with dryers from one to three days, according to the weather, is time enough for each coat to become hard enough to receive the next one. For a dryer, one tablespoonful of japan varnish is sufficient for 10 lb. of the keg paint. No dryer is needed if painter's boiled linseed oil is used in place of the raw oil.

Meteorites. In the 'Concentrates' of a recent issue, mention was made of the Willamette meteorite which was found near Portland, Oregon, and about which litigation arose between the finder and the owner of the land upon which it was found. The claim of the finder was based on two grounds. First the meteorite was a gift from heaven and therefore to be possessed by the discoverer. The court rejected this plea, and while admitting that it was a gift from heaven, decided that heaven gave it to the man on whose land it fell. The second claim was that, since it had been used by the Indians in some of their rites in early days, according to the testimony of survivors produced in court, and since the Indians had ceased these practices, the meteorite was in the law like a cast-off tool or implement to which any finder may lay claim, and which he may carry off, regardless of the ownership of the land. But the court decided against this plea also, and restored the meteorite to the owner of the land.

It is unsafe to estimate the value of either a quartz or placer prospect in the pan by counting the colors that may be seen without knowing what amount of material was taken in making the test and what the weight of the gold saved is. A prospector can become expert in his judgment of the gold content of either a quartz or gravel panning, but this he learns by experience which must necessarily be renewed in each new district or mine. Some gold which shows up well in the pan is light and scaly, and the panner is likely to overestimate its value. Other gold, though occurring in very small particles, may be round and heavy, running higher than one might expect on first judgment. A pan of gravel will vary considerably in weight, depending on the character of material composing it. Some gravels contain large amounts of iron ore, garnets, and other minerals which are above the average of specific gravity of ordinary rocks. Such gravel will weigh more for a given volume than that composed of slate and quartz pebbles and sand. Ordinarily a full pan of gravel will weigh about 20 to 30 lb., but miners rarely fill the pan unless the gold be coarse and heavy, owing to the liability of loss in the preliminary stages of washing. When panning to ascertain the value of gravel per cubic yard, several pans of the material should be weighed to get an average, and the estimate made in accordance with the result, or a cubic foot of the gravel may be washed, pan at a time, and the total amount of gold obtained taken as the basis for calculating the quantity of gold per yard.

Grades. Flat slopes such as a railroad grade are expressed either in feet to the mile or by percentage. Thus we may say a one per cent slope or one foot rise in 100 ft., which is equivalent to 52.8 ft. to the mile of 5,280 ft. The slope of a sluice box or a launder may be given in inches per foot. Thus the slope or grade of an apron-plate may be 1.25 or one-and-one-quarter inches per foot. The slope or grade of a launder may also be expressed as the drop or fall for the length of a 12-ft. section. Thus we may say, 3 in. in 12 ft. In these cases the rise is mentioned first. On the other hand, for steep slopes, as those of earthwork, the horizontal distance is mentioned first. Thus stated, a slope of 2 to 1 means a slope of 2 horizontal to 1 vertical. The slope or pitch of a roof again is expressed as the ratio of its rise to its span. Thus we say that a roof has a one-third pitch when its rise is one-third its span. A roof of 60 ft. span would, if of one-third pitch, have a rise of 20 ft. vertical above the eaves at its ridge. This applies to a regular roof having two slopes. For a roof having but a single slope (a shed roof) it would still mean the same rise, but the span has decreased to one-half.

Conglomerate, agglomerate and breccia are terms often confused. By 'conglomerate' is meant a mass of water-worn detritus—cobbles, pebbles and sand, coarse and fine, cemented by some mineral substance, such as calcium carbonate, iron oxide, silica or clay. 'Agglomerate' is a term applied to a quantity of cemented or partly cemented fragmental rock material and refers more particularly to lava fragments which have become consolidated at the foot of cliffs, or in streams, or scattered over large areas in the vicinity of volcanic vents.

These fragments are usually large and small, including volcanic cinder and ash. If by erosion this volcanic material becomes water worn and cemented, it then becomes conglomerate. Conglomerates form in river beds, and on sea or lake shores. 'Breccia' is the term used to designate rock which has been shattered in place, the fragments occurring in every size from minute grains to great masses, and being cemented by the infiltration of foreign mineral—calcite, silica, iron oxides and occasionally sulphide ores containing gold and silver as well as base metals. Conglomerates are frequently metal-bearing, carrying metallic gold or copper, and ores of the base metals. Many of the most valuable ore deposits known occur in brecciated zones. Almost every kind of metal mined is found in fractured rock masses of this description, including copper, gold, silver, lead and zinc.

Re-location.—When a corporation or an individual abandons a mining claim or group of claims it becomes immediately subject to re-location, but it would be most unwise for any person to re-locate such claims when they are not subject to re-location by reason of failure to do assessment work as required by law, without first securing from the proper officials of the company—the president, secretary, and board of directors, or from the individual locator—a statement in writing specifically setting forth the fact that the claims had been abandoned. The person who originally located the claims would have no precedence over others in this matter unless the company or individual holding the quit-claim deed gave him the advantage of first knowledge of intended abandonment. A stockholder performing the assessment work in the interest of the company would only complicate matters. It would be better to allow the claims to become subject to re-location by failure to perform the necessary work, and for the stockholder to then locate in his own name. As to power of directors of a mining corporation to shut down the mine, disposing of tools, machinery, supplies, etc., and to transfer title of claims to another without calling a special meeting of stockholders, this would probably be determined by the constitution and by-laws of the company. This question should be referred to a corporation attorney in the State where the company is incorporated.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

MINING METHOD WANTED.

THE EDITOR:

Sir: I have a problem in practical mining to solve, and believe the expert who has charge of 'The Prospector' department can help me out. The problem may be stated as follows:

Given: A vein of low-grade ore, 50 ft. in thickness, dipping uniformly into a mountain at an angle of 23 degrees. Timber is available, but the low grade of the ore makes it desirable to avoid its use as far as possible. It is difficult to attack the vein from the surface on its strike, owing to the topography of the country. The ore deposit may be best described as a broad silicified zone of impregnation, conforming approximately to the strike and dip of the country rock—a rather coarse mica schist. The ground stands well so far as development has progressed, the hanging wall which constitutes the back of a large stope in this vein stands well without timbers. The slope angle of the hillside along which this vein outcrops is about 30 degrees, the croppings being about 500 ft. above the bottom of the canyon.

Wanted: A mining method whereby this vein can be expeditiously and safely mined without loss of ore, and at minimum expense.

The mine is situated in California, about 40 miles from the nearest railroad station, and strict economy is necessary in every branch of the business.

The method already tried has been that of driving a tunnel into the mountain in the foot-wall of the vein, which is reached about 600 ft. from the apex, on the dip of the vein, the tunnel having been extended through the vein to the hanging wall. From the hanging wall a stope has been carried backward toward the foot on that level, but this scheme is not wholly satisfactory.

NEW SUPERINTENDENT.

Acton, April 25, 1906.

The problem submitted by New Superintendent is one involving some uncertainty, an unavoidable element in every untried proposition in the business of mining. The best mining method cannot always be arbitrarily decided upon for any particular case prior to trial. Satisfactory methods are usually the result of experiment and evolution. If one method does not produce the best results, recourse is had to another, and methods long in vogue are improved from time to time. The character of the wall rocks, and of the ore itself, as to its standing qualities, are most important. By employment of the square-set system, and contemporaneous filling, almost any of the difficulties usually encountered in stoping orebodies may be overcome, but in the present case strict economy must be observed, and economy in this instance means low cost of mining and operating expense.

The long tunnel, driven nearly 1,000 ft. to reach the vein at a depth of 600 ft. on its dip, appears to have been an unnecessary expense, although it may eventually prove serviceable as a drainage outlet, and it will certainly aid ventilation.

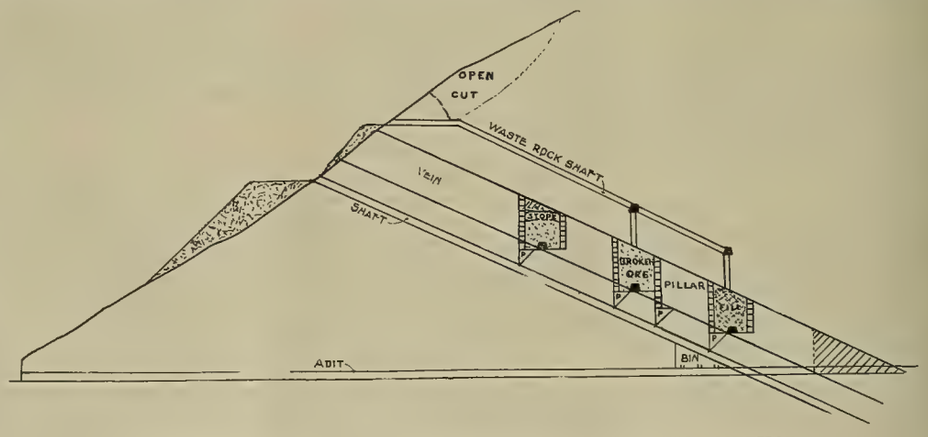
To continue to stope the vein along the lines described will certainly invite disaster. There is a limit to the extent of the superficial area to which a stope may be carried with safety. The best-standing ground has its limitations, and the removal of too large an area will inevitably result in collapse of the hanging wall country. In some instances this fact may be utilized to advantage, as where the caving system is employed, but this case does not appear to be one of them.

As viewed from a distance, and basing judgment on the statement of conditions said to exist, it is suggested that an inclined shaft be sunk from the surface in the footwall of the vein and about 30 ft. below it. This shaft should be carried down to the tunnel level, at least, and connected with it. The vein should be opened by a series of rooms, or stopes, driven longitudinally on the vein. Each stope should be 50 ft. wide, and 60 ft. would be better if the ground stands well enough to admit of it. A main gangway, heavily timbered, should be driven on the sill floor in the middle of each room, on a line normal to the shaft—extending to right and left—on both sides of it. If the ore breaks reasonably small, so that it may be handled through chutes, these should be built at stated distances, say every 30 ft., along the gangway, but if the ore breaks very large, so as to prevent handling through chutes, these had better be dispensed with, and all rock broken in the stopes shoveled into cars from the floor of the level, after the large masses are broken up by bulldozing or blockholing, by men whose particular duty it is to attend to this. The stope should then be opened up to the full width of 60 ft. and a line of square sets carried up on either side of the stope in the direction of the strike of the vein. See accompanying sketch.

The ore may be broken down in the stopes, only enough being drawn off on the sill floors to keep the miners within easy reach of the back.

These several stopes, which should be opened in alternate blocks (two stopes being separated by a 60-ft. block of ore, to be subsequently removed in the same manner as the first), must be connected with the shaft by winze for the passage of men and for ventilation. A liberal-sized ore pocket should be cut under each stope, immediately above the shaft and convenient to the gangway, into which the ore, brought by cars through the gangway, can be dumped. The floors of these stopes and blocks of ore will be arranged in a series of steps, each one nearer the surface being about 12 to 15 ft. higher than that next below.

If the hanging-wall country, when reached, is found to stand well over the entire stope, say 60 ft. wide, and of indefinite length, it may not be necessary to fill at once, but the danger will present itself when an attempt is made to stope the intermediate block—the two original stopes and the intermediate block making a total width of 180 ft., which is a dangerously large area to leave without support. It is therefore necessary to fill the stopes with waste as the ore is withdrawn before attempting to stope the intermediate block. This may be done by driving the stope some distance to either side of the shaft, allowing as much of the ore to remain in the stope as possible, thus affording support to the roof, should it begin to subside.



ILLUSTRATING CONDITIONS REQUIRING SPECIAL MINING METHOD.

When it becomes necessary to remove all of the ore, the shovelers should be placed at the end of the heading most distant from the shaft, the gangway having first been driven forward some distance beyond the face of the heading to facilitate future operations. As the ore is removed in the cars, a large open space will, in time, be left, sloping upward from the gangway floor to the back of the stope, a height of 50 ft. Filling must now be introduced, and it is an uncertain question as to where this waste rock shall be obtained, and how it may best be handled. If the hanging-wall country is sufficiently firm, inclined raises from the back of the stope may have been driven into the hanging, from which large chambers may be opened out, the rock falling into the stope beneath as fast as it is shot down. If this method is too dangerous it may be advisable to sink an incline from the surface in the hanging wall of the vein, and to break the waste there in an open cut, delivering it to the stopes by means of cars running in drifts over a series of mill holes, connecting with the stopes. Probably this latter would prove the better way.

The method of stoping here proposed is a modification of the Homestake system, differing from it chiefly in that the stopes are driven longitudinally of the vein instead of across it, from wall to wall, but the method of filling at the Homestake is very different, and far more simple, owing to the higher angle of dip and the great size of the vein.

When all of the payable ore has been removed from the surface down to the tunnel level, it might be expedient to continue the inclined shaft downward, opening out new stopes in the same manner as above, and sending the ore out through the tunnel instead of hoisting it to the surface through the incline. Also, if desirable, the ore stoped from above this adit may be lowered to that level and trammed in trains to the surface instead of being hoisted in single cars, or skips, through the incline. Liberal-sized ore bins could be provided beneath the shaft, and above the tunnel level, from which cars could be quickly and inexpensively loaded.

As the work progresses, many minor problems in detail will present themselves, each of which must be solved independently, and which cannot be anticipated at this time.

THE PROSPECTOR.

VOLCANOES AND VOLCANIC ACTION.

THE EDITOR:

Sir—Earthquakes are not necessarily the result of volcanic action, although most of those occurring near the sea-coast have this origin. Charleston was an exception; the occurrence at the Southern city represented only a slip of one stratum on another. A slip due to a thin selvage of clay between strata, or a slip along the line of an old fault, may cause an earthquake even in the midst of a continental area, and yet in no respect would the cause be volcanic. This probably applies to San Francisco.

The old ideas concerning volcanoes have been modified. Sir John Lyell was the father of the theory that volcanic outbursts were mere local phenomena. His idea was that the local seepage of sea-water into cracks leading down to the molten lava, caused volcanic emanations—such as those of Vesuvius, Etna, and Stromboli. Many modern geologists are still afraid to depart from this view. For example, Heilprin and several others who went down to Mt. Pelé, in Martinique, after the event, came back all talking of it as a local phenomenon. In regard to the recent outburst of Vesuvius even a German savant is reported as attributing the whole thing to spots on the sun!

A short time before Mt. Pelé got in action, Colima in Mexico had an eruption; then La Souffriere in the Island of St. Vincent, in the Windward group, became restless; this was followed by the outbreak of a volcano in Costa Rica; and then Mt. Pelé began. It paused awhile—and in Nicaragua a similar local and sporadic outburst started. And then Mt. Pelé became the whole show. But some of the visiting geologists reported that it was purely a local phenomenon, due to seepage of salt water on hot stones below.

Some fourteen years ago, N. S. Shaler, professor of geology at Harvard University, proposed a broader theory than that of Lyell and his friends. Being a very quiet, modest, as well as able man, his views caused no sensation, for he did not push it or orate about it. He noted that:

1. All active volcanoes in the world today are either on the coast, in case of continental areas, or on islands in the sea. Etna, Vesuvius, Stromboli, Hecla, Fujiyama, Chimborazo, and Krakatoa sufficiently illustrate this point. Extinct volcanoes now in the midst of continental areas, once were on the sea-coast. But they have been silent ever since.

2. Certain rocks are known as sedimentary rocks, such as sandstone, limestone, and slate. Originally deposited in the deep sea, in the form of sediments of sand, lime, or clay, they were compacted by pressure and afterward uplifted to the light of day. Many of these have been later subjected to metamorphic action obscuring their sedimentary origin, but the majority of them still remain as unmetamorphosed sedimentary rocks.

3. The seas are still depositing sediment, just as they did in primordial time. In one place the sedi-

ments are still sand; in another place, lime; in another, clay. The rate of sedimentation has long been studied carefully in the various seas and zones, and we still recognize that these loose sediments of sand, lime or clay, being deposited today, may become sandstone, limestone or slate at a future date. As naturally would be supposed, the rate of sedimentation in the warm waters of the tropics has been found greater than in the colder seas of the north.

4. Any given sediment falling to the bottom of the sea carries down with it a great excess of water, that remains with it.

5. Given a bed of sediment deposited from the sea, full to excess of water; another weight of sediment falls upon it—and another—and still many others. As this weight of subsequent deposits begins to accumulate above the lower sediment, at least two things must eventually happen to that sediment underneath. The first is a continually increasing compression, as the result of the accumulating weight above. As this compression continues, the semi-fluid sand or lime or clay sediment becomes more and more compact. And its final state may be rock. But pressure usually produces heat; and as the pressure on this lower stratum increases by continuous loading above, the heat will increase in proportion.

6. But no matter what the pressure may be from above, the excess of water carried down by the original sediment still remains in it. But without doubt as the increasing pressure produces increasing temperature, it must be the excess of water in the original sediment that proves itself most sensitive to the increasing temperature.

7. And still other sediments add their weight from above. And still the temperature of the included water in the lower strata increases. The boiling point is reached—and eventually higher temperatures. But still this highly heated included water is not strong enough to break out and free itself from the enormous mass and weight keeping it in place and intact.

8. But may not a time arrive, when the pressure above has created such enormous temperatures and powers of expansion in the water included in the lowest strata of sediment, that finally, with the strength of a giant, it does break out, with a temperature far surpassing that of the Siemens-Martin furnace?

9. It breaks out along the line of least resistance; that is, the line of original sedimentation. And that line of least resistance leads it toward the nearest shore—whether of island or continent.

10. And as this fearfully superheated steam rushes along the line of least resistance seeking a vent, it melts the rock along its path, and carries it along. And when at last the vent is reached, it hurls the melted rock out, and even blows it into fine dust, to be carried away by the winds.

11. But its rush is so tremendous that earthquakes, due to this intense volcanic energy, do form one of the side phenomena.

12. What does the volcanic smoke mainly consist of? Steam.

13. What was the real history of Mt. Pele? The whole Carribean area was involved, from Mexico and Central America to the West Indies—a distance of more than 2,000 miles. More than that, at that very time Vesuvius and Etna—3,500 miles away—became restless.

14. What is the history of the recent eruption of Mount Vesuvius? Undoubtedly it represents a state of stress and strain in lower sediments of the whole Atlantic area, and it would be no surprise, to learn of a volcanic outbreak at some other point in that area, the Canaries, Teneriffe, the West Indies, or Central America. For it will occur unless perfect equilibrium has been restored by the outbreak of Vesuvius.

15. What may have caused the outbreak at San Francisco? Stress and strain in the lower sediments of the Pacific area. Without doubt the seismic impulse came from the Pacific. As yet we have no certain news of the exact locality from which the impulse came that destroyed San Francisco. It may have been from the Hawaiian Islands, or from islands of the sea not connected by cable, or from those of the Dutch India Archipelago. We shall know later.

N. S. Shaler, professor of geology at Harvard University, to whom this brilliant and seemingly competent theory is due, died two weeks since and was buried at Cambridge, Mass. I have been familiar with this theory for at least fourteen years, and the above notes have been written off-hand.

A MINING ENGINEER.

New York, April 24, 1906.

The Recovery of Copper From Mine Drainage

Written for the MINING AND SCIENTIFIC PRESS by PHILIP ARGALL.

The precipitation of copper from mine drainage is of comparatively recent introduction in the West, while in Europe it has been established as a profitable industry for at least 200 years. When and where the process of precipitating (on iron) the copper in mine drainage was first turned to practical account is difficult to determine. The phenomenon of cementation is mentioned by Agricola, who wrote in 1546. The process is said to have been in operation near Rio Tinto, Spain, in 1661. Dr. Edward Brown, in the Philosophical Transactions for the year 1670, describes the process of copper precipitation as practiced at the Ziment Springs, Herrengrund, while at Agorda in the Venetian Alps it was said to have been introduced in 1692. As far as I can find out, the first practical application in the British Isles of the process of precipitating the copper from mine drainage upon iron scrap, occurred at the Cronebane mines, in Wicklow county, Ireland, about the year 1750. Dr. Henry Kenroy, writing in the Philosophical Transactions for 1751, states that the process was discovered by reason of some workmen at the Cronebane mine having left a shovel in the mine water, which was found when taken out to be turned into copper. Whereupon Mr. Matthew Johnston, one of the proprietors of the mine, turned the discovery to account, in the following process, which is compiled from Dr. Kenroy's paper, previously cited.

The drainage of the mines was run into a chain of oblong pits, each ten feet long, four feet wide and eight deep, the bottoms of which were laid with smooth flagstones and the sides built up with stone and lime, with rude wooden beams across the pits to lay the iron bars upon. The copper replaced the iron, which passed off in solution; to hasten this reaction, the iron bars were frequently taken up and the copper rubbed off into the pit; in about twelve months the whole bar was dissolved if the iron was soft but hard iron or steel was acted on less quickly and therefore was found not to answer so well. When the iron was dissolved, the water was turned off the pit and the copper shoveled out; this red copper mud was laid in heaps and when dry became reddish dust. One ton of iron produced 1 ton 19½ cwt. of this precipitate, each ton of which produced 16 cwt. pure copper; that is to say one ton of iron was sufficient to produce 1 ton 11½ cwt. copper which was worth £10 more per ton than the copper smelted from the ore.

It was subsequently found advantageous to run the drainage into settling pits, and to pass only the clear water over the irons. Evidently only a small quantity of the copper in solution was saved, as it appeared that the pits might be continued as far as the workers pleased; for the waters did not sensibly abate in quality by being subjected to the process. The quantity of copper running waste about this time must have been enormous as in one stream, 'the Sulphur brook', it was calculated to be 129,600 grains per minute, or 124,100 lb. per annum.

Dr. Pryce, in his Mineralogia Cornubiesis, published in 1778, page 291, gives credit for the introduction of copper precipitation at Cronebane to some Cornish miners who, having emigrated from Chacewater, settled at Cronebane; he adds, "Captain Thomas Butler, who was one of Redruth, and manager of that mine (Cronebane), persuaded the proprietors to adopt the scheme of precipitating copper." It is also related that the precipitation of copper on iron was noticed at the Chacewater mine, Redruth, Cromwell, in 1728; but I believe no practical use was made of the discovery till 1854. That a person named Butler was once at Cronebane is probably true, as there is a shaft on the property known as the Madam Butler. This, however, shows a leaning toward Irish gallantry; I do not recall that Cornishmen name shafts after their wives, and the name Butler is surely Irish. Then, as Dr. Kenroy wrote of what he had seen in 1751 and Dr. Pryce of what tradition had handed down to him, 27 years later, I am inclined to support the former and award to the Irish the first profitable application of the copper precipitation process in the British Isles. Furthermore the precipitation of copper from Cronebane mine drainage was an industry of considerable magnitude 150 years ago, the production of copper precipitates from 1753 to 1765 amounting to no less than $82,280; quite a respectable output considering the small amount of development on the veins, the appliances used in precipitation and the recent introduction of a mysterious and little understood process.

The pumping of acid waters in many Western mines is yet a matter of much experiment and considerable expense, on account of the corrosion of the pipes, plungers, etc. Many experiments have been made, with lead-lined pipes, special bronzes and subtle chemical compounds, in attempts to re-solve a problem that our forebears had satisfactorily elucidated before the foundations of modern chemistry were laid. Probably the first form of pump-column was the bored out and hooped log. These I have myself seen in the old workings of the Cronebane mine, abandoned before the time of the oldest miner thirty years ago, showing they are probably considerably over a century, and perhaps two centuries, old.

With the introduction of cast-iron pipes, it was but a short step forward to line them with wood, known at that time by previous experience, to be practically unaffected by the cuprous waters; nay more, it was found that the wood-lined pipe accumulated a deposit of ferric oxide which adhered tenaciously to the wood, and if not scraped off periodically it would in time choke the pipes.

I remember when a schoolboy seeing very acidulous water pumped from the Wicklow copper mines by means of Cornish pumps, the cast-iron water-columns of which were lined with quarter-inch soft-wood staves, the flange-joints of the pipes were made with gaskets composed of an iron ring 1½ by ¼ in., around which was wrapped a thickness of two inches of coarse flannel soaked in tar. In screwing up the pipe-joints this tarred flannel was pressed out over the wood lining, securely sealing the iron pipe from the acid waters, as well as making a tight joint between the pipes. Coarse tarred flannel was also wrapped around the pipes where exposed to falling water, and it was well painted with warm tar. The suction pipes for these pumps were made from logs of beech wood, bored out to size and the bottom drilled with suitable holes to form the straining orifice for the pump; the plungers and glands were made of bronze, the valves of copper and leather, but these metals corroded and were about the only parts of the pumps that required frequent attention and occasional renewal. I might add that in a wide and somewhat varied practice extending over thirty years I have never seen a case where the foregoing appliances would not satisfactorily handle the drainage of copper mines, no matter how corrosive.

The nature of the reaction between metallic iron and copper solution was of course not understood in 1751, twenty-three years before Priestley discovered oxygen; a quarter of a century before Lavoisier elucidated the theory of combustion and 53 years prior to the announcement of the atomic theory by Dalton. Therefore in the limited precipitation works existing at the time when Dr. Kenroy wrote, the operators might well be excused for considering the transmutation of iron into copper a continuous and unending reaction, for so far as their works extended "the water did not sensibly abate in quality by being subjected to the process." The mine drainage was evidently very rich in those early days; however, 47 years later (1798), the copper value of the Cronebane mine drainage had fallen off materially and we find the poor pyrites ore was heap-roasted and subsequently leached to enrich the copper salts in the drainage of the mines. As the active working of the mine fell off, the copper carried in solution gradually disappeared. I helped to re-open the Cronebane mine in 1874, at which time the effluent water carried but a slight trace of copper, though the mine had not been closed over twenty years. The drainage adits were, however, filled with ocher almost to the roof and the above-water stopes and vein exposures were almost completely sealed with ocherous deposits.

The Connorree mine, adjoining Cronebane to the east, was credited prior to 1872 with $75,000 worth of copper precipitate per annum, and was worked for a year or two almost entirely for the cement copper obtained from the mine drainage. This be it remembered, with coal at a high figure and all the water pumped from a depth of 90 fathoms. The mine closed down in 1880 and has not since been opened, but a published analysis of the stagnant mine-water taken in 1884, showed, it is claimed, 40 grains of copper to the gallon,—an excessive amount. The process of kernel roasting was carried out on the low-grade copper ores of the Connorree mine in the late sixties, and the oxidized envelopes of the sulphide kernels were leached in the mine-water, to remove the soluble sulphates, and enrich the waters on their way to the precipitation plant.

The Ballygahan mine on the same lode series, but west of the Avoca river, was not much of a copper mine, but a precipitation plant was added near the close of its active career, continued in daily profitable operation for five or six years after active mining had ended. The pumps, however, were operated by water power. Mr. G. A. Kinahan made the following analysis

of Ballygahan mine waters about two years after the close of active mining: (The returns are in parts per 100,000.)

	Before Precipitation	After
Ferrous oxide	81.81	94.75
Ferric oxide	4.30	6.70
Cupric oxide	9.32	1.91
Sulphuric acid	634.26	642.34
Manganese oxide	2.30	2.50
Zinc oxide	1.20	1.80

Returning to the Cronebane mine, the re-opening of which, after twenty years' idleness, I have previously referred to; it was found that as the stopes, drifts and working faces were cleaned, oxidation again proceeded; and the effluent waters of the mine became rich in copper. The portal of the principal adit, however, was well within the boundary of the adjoining property, the owners of which made big profits from the enriched drainage of the Cronebane mine. After repeated demands for a share of the profits derived from the precipitation works, which met with as many refusals, I was instructed by the manager of the Cronebane mine—whose assistant I then was—to proceed with the underground precipitation plant that we had worked out. The plant was a great success, as owing to the higher temperature of the water, its freedom from sediment and almost entire absence of ocher, we secured excellent precipitation. Our selfish neighbors were, however, almost driven out of business, as owing to the oxidation of the ferrous salts traveling through 2500 ft. of adit, the water carried much suspended hydrated ferric oxide on reaching the surface, and the precipitation plant of our neighbors acted mainly as catch pits for the ocher.

Immediately below the gossan of the Cronebane vein a rather soft clay filling occurred, carrying abundance of granular pyrite and various copper minerals, including sulphate; the leaching of these deposits in place by first opening them up with numerous small drifts and then turning down water through the loose gossan, soon formed a prominent portion of our mining work. These copper-bearing solutions were collected on the various levels between the outcrop and the lower adit, turned down through certain old stopes and fillings and were finally collected at the lower adit, the copper being precipitated from solution on pig iron. As we had no pay-ore on this adit at that time, our mining operations there consisted in lowering pig iron through the shafts, hoisting cement copper and attending to the underground precipitation plant.

As experience was gained in leaching copper ore in place, the following working cycle was evolved: (A) A period for oxidation; (B) A period for solution and (C) A period for the removal of the ferric oxide which had a tendency to seal up the sulphides and prevent further oxidation. The first two periods were obtained by dividing the ground into sections, some of which were oxidizing while others were leaching. The C period was obtained by running short drifts across the vein and allowing them to cave; stoping was in some cases resorted to, simply to give room for the settling of the vein matter,—while in bad cases the vein-matter in places was caved through to the gossan workings, and the material used to fill stopes below, in which the caved material was in due time again subjected to a leaching process. The method was entirely successful, but after my retirement it fell into disuse and the mine was eventually closed down.

I visited this property in the summer of 1901 after twenty-two years' absence, during twenty years of which the mine was idle. I found that the precipitation of copper from the mine drainage had long since been abandoned, because there was but little copper in the water, and that little could not be precipitated on account of the great quantity of ocher present. The ocher industry was, however, flourishing, large settling ponds having been constructed at the mouths of the adits, to collect this pigment, which commanded a ready sale. Some men were gophering through the softer and yellowish gossan on the back of the lode, in search of ocher of sufficient purity for pigment. One party had penetrated the gossan and reached the soft granular pyrites previously described; their picks and shovels, coated with metallic copper, excited no attention from the descendants of a keen and intelligent race of miners.

Here the shovel episode of 1750 is repeated, a century and a half later, in a slightly different manner. The copper sulphate in the moist pyritic sand and clay underlying the gossan attacked the iron of the tools, plating them with copper. The mining spirit and even tradition had, however, taken their departure, and the husbandman gophering between seedtime and harvest in the surface workings of a great vein, failed to realize the importance of the treasure that not only surrounded him, but actually plated the instruments of his toil.

The Southeastern Illinois Oil Field.

Written for the MINING AND SCIENTIFIC PRESS by H. FOSTER BAIN.

While oil has been obtained for a number of years in Illinois, the quantity has always been small. In the last year a new field of considerable importance has been developed in Clarke, Crawford, Coles and Cumberland counties, south and west of Terre Haute, Indiana. This field has been producing since last June and now is shipping 60,000 bbl. per month. Only a portion of it is yet reached by pipe-lines and a large increase in production within the year is expected. The oil lies mainly at shallow depths, 300 to 400 ft. and therefore is apt to be pumped out rather quickly. In the southern part of the field where the wells are as much as 900 ft. deep, a longer life, though not necessarily a greater total production, may be predicted.

The oil occurs in sandstone and porous limestone about at the base of the coal measures. The principal localizing factor seems to be a low, rather flat, anticline, which, not improbably, marks the southeastern extension of the well-known La Salle anticline. The field, while near that of Terre Haute, is not related to it, but belongs probably with that at Princeton, Indiana, where oil has been pumped for several years.

The area is now being investigated for the Illinois Geological Survey by W. S. Blatchley, who has been assisted by A. W. Lewis. The following analyses, made for the Survey by F. F. Grout, indicate sufficiently the grade of the oil.

Crude Petroleum No. 1 Briscoe Lease. Original oil had sp. gr. 0.887. Flashed and burned at 60° C. 500 c.c. used for distillation. The heat was raised slowly until the first drop fell from condenser, and then regulated so as to distill at a regular rate of about two drops per second. First drop came at 88° C.

Distillate	Volume per cent	Sp. gr. at 15.5° C.	Beaume degrees	Flashed Centigrade degrees	Burned Centigrade degrees
Up to 150° C	4.4	0.745	58		5
150 to 200	11.0	0.773	51	15	25
200 to 250	9.1	0.813	42	58	60
250 to 300	13.1	0.844	36	70	95
300 to 350	50.0	0.863	32	45	76
Coke (and loss)	12.4	—	—	—	—

First three distillates colorless with slight opalescence. Color began to distill at 290°. Bloom or fluorescence began to be noticeable about that time. All fractions darkened in 24 hours. First two distillates had good, sweet, oily odor. Next two were very strong with H_2S, after standing a short time. Last fraction had also a slight odor, and was brownish red to green fluorescent. The oil seemed to 'crack' readily and completely to coke and an oil was distilled at about 325° C. If the process was stopped before complete, the residuum was a black pitch of various degrees of hardness depending on the degree of distillation. When 80% of the oil (by volume) had been distilled, the fraction above 300° had a specific gravity of 0.860 and flashed at 47° C. The residuum was a little too soft and sticky to be chewed in the mouth. About 3% more left a good firm asphalt-like residuum; 4% more left coke. The last 7% of oil to be distilled had a specific gravity of 0.878 and flashed at 43°. Cold test was 10° C. The low-flash test of the fifth fraction is further proof of the 'cracking'; 100 c.c. of this was re-distilled in part to see if the flash could be improved. After 15% was distilled, the remainder flashed at 150° C. Sulphur in original oil equals 0.23 per cent.

Crude Petroleum No. 2, Bayliss & Haskel Lease. Original oil had sp. gr. 0.873. Flashed and burned at 38° C. Tested as No. 1 was, and was very similar, a little lighter. First drop came at 53° C.

Distillate	Volume per cent	Sp. gr. at 15.5° C.	Beaume degrees	Flashed Centigrade degrees	Burned Centigrade degrees
Up to 150° C	8.6	0.741	59		5
150 to 200	10.6	0.778	50	12	20
200 to 250	10.7	0.814	42	50	60
250 to 300	13.5	0.841	36	74	107
300 to 350	48 0	0.853	34	37	45
Coke (and loss)	8.6	—	—	—	—

Same kind of distillates as came from No. 1. When 84% (by volume) was distilled, the residuum was soft and sticky at ordinary temperatures. When 87% was removed it was hard and could be chewed in the mouth. These asphalt-like residues were quite odorless and nearly tasteless. The flash test of the fifth distillate could be raised as before, by distilling off about 15% of the lighter oils which evidently resulted from 'cracking' during the first distillation. Sulphur in the original oil equals 0.73 per cent.

Crude Petroleum No. 3, Rivet's Well. Original oil had sp. gr. 0.870. Flashed at 43° C. Burned at 60° C. Much like No. 1 and 2. First drop came at 60° C.

The oil crackled and sputtered about 90° C. and when the first distillate was examined it was found to be in two layers. Probably a little water caused the trouble. The lower layer amounted to about 0.5% of the original oil. There was no odor of H_2S—neither during the distillation nor after the distillates stood 24 hours in a closed flask, 0.10% sulphur was found in the original oil.

Distillate	Volume per cent	Sp. gr. at 15.5° C.	Beaume degrees	Flashed Centigrade degrees	Burned Centigrade degrees
Up to 150° C	3.5	0.749	57		5
150 to 200	12 0	0.775	51	—	22
200 to 250	14.2	0.809	43	52	70
250 to 300	10.6	0.837	37	80	92
300 up	50.2	0.849	35	27	45
Coke (and loss)	9.5	—	—	—	—

By way of comparison the results of an examination of the Indiana oils are quoted below. These analyses were made by W. A. Noyes. The Terre Haute oil is from the Corniferous, while the Van Buren oil was from the Trenton of Grant county.‡

	TERRE HAUTE				VAN BUREN.			
	Per cent.	Sp. gr.	Beaume Degrees	Flashing Point Centigrade	Per cent.	Sp. gr.	Beaume Degrees	Flashing Point Centigrade
Original oil		0.879	30			0.853	35	
Below 150° C					7.2	0.719		Below 20
150 to 200	12.0	0.793	48	38	10.2	0.759	56	Below 20
200 to 250	14·0	0·825	41	65	10.2	0.799	47	60
250 to 300	13.6	0.847	36.5	85	12.2	0.826	41	82
300 to 350	14.8	0.867	32.5	97	14.8	0.844	37	96
350 to 390	40.6	0.879	30	45	41.8	0.860	34	38
Total distillate	95.0				96.4			
Residue by weight	6.2 per cent.				4.5 per cent.			
Sulphur	0.72 per cent.				0.83 per cent.			

The oils were distilled rather slowly from flasks with the thermometer in the vapor only. A thermometer filled with nitrogen and graduated to 460° C. was used. The oils appear to be quite similar in general character, but there is less of the low boiling products in the Terre Haute oil, and the specific gravity of the oil and of the various distillates is higher. The portion of the Terre Haute oil boiling at 350 to 390° deposits considerable amount of solid paraffine at 15° C. The low flashing point of the high boiling oil must be due to a partial 'cracking' of the oil. From the results, I calculate the following percentage of naphtha and kerosene contained in the petroleums:

	Terre Haute	Van Buren
Naphtha below specific gravity 0.73	none	10 per ct.
Kerosene between specific gravity 0·73 and 0.83	30 per ct.	33 per ct.

Ventilation by Compressed Air.—The Associated mines, at Kalgoorlie, Western Australia, have a large air compressor, designed for 60 drills, and stated to be able, with an expenditure of 1,000 horsepower, to compress 5,000 cubic feet of free air per minute. According to the returns made by the manager, the amount of air ordinarily put into the underground workings is 1,700 cubic feet of free air per minute, which supplies 20 drills and two air winches, while about 100 cubic feet per minute are used in driving pumps. Taking the winches as using 300 cubic feet per minute, and neglecting leakages, the amount supplied to each drill would average 65 cubic feet per minute. The number of men underground is returned at 292, or, say, 100 men in one shift. The total amount of air per man put into the mine by the compressor therefore only averages 17 cubic feet per minute. Taking the men on the drills only, each drill having two men, the quantity per man averages 32½ cubic feet per minute. As each drill when actually working probably liberates over 100 cubic feet of air per minute, the average of 65 cubic feet must be much higher than the amount set free while the drill is not working, and the amount supplied to the men while setting up the machine must be very small. Usually the air is used for blowing out the smoke, and then is cut off, or almost so, while the men rig the drill. During this period the ventilation is often very deficient. Analyses made by Mr. Mann show that even when the drills are running, there are places where the ventilation is bad.

The Commissioners do not wish to be understood to mean that in the instance quoted and in similar cases the only ventilation in the mine is that from compressed air, for, as a matter of fact, the principal air supply to these mines is obtained from natural ventilation. The figures quoted were meant to show that the compressed air by itself is a quite insufficient supply, and would not alone be able to maintain the air in a pure state. Usually, there is a certain amount of air from the main airways slowly finding its way into even such places as are some distance from the main air currents, and gradually removing the vitiated air.—From Report of Royal Commission, Western Australia.

‡Indiana Dept. Geol. & Nat. Resources, 25th Annual Report, 1900, pp. 518-519.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The mineral specimen from Kendall, Mont., is hematite, (iron oxide).

The rock from Tombstone, Ariz., marked A. G., is quartz. The included greenish crystals are fluorite.

The sample rock marked No. 1, from Barron, Wash., has the appearance of being a much altered hornblende-andesite. No. 2 is quartz-porphyry.

Sample No. 11, from Homestead, Ore., marked C. C. C., is an acid dike rock, considerably altered, and veined with seams of calcite. No. 12 is felsite, with pyrite. Felsite is also an intrusive rock. It is probable that No. 11 was also originally felsite.

Sample No. 1 from Chilpancingo, Guerrero, Mexico, consists of granular quartz and scales of chlorite altered from hornblende. It is a metamorphic rock. Veinlets of pyrite and quartz are arranged in nearly parallel lines extending through the rock. No. 2, is a metamorphic rock, probably Diorite, in which there is considerable quartz with a streak of Mispickel, (arsenical-iron sulphide.) No. 3, is a complex sulphide ore, in which the most abundant minerals are bornite, chalcopyrite and pyrite. Galena and zinc-blende are also present in finely disseminated grains. The ore probably contains precious metals, also.

The rocks and minerals from Oracle, Ariz., marked

THE DRILL AT WORK.

A. B. C., are determined as follows: No. 1, Calcite discolored by iron oxide; No. 2, a brecciated feldspathic dike rock with much infiltrated quartz, and disseminated iron ore; No. 3, Diorite; No. 4, Amphibolite-schist; No. 5, Quartz-diorite; No. 6, Diabase; No. 7, Marble (crystalline limestone); No. 8, Silicious iron ore; No. 9, Chrysocholla; No. 10, Malachite, (copper carbonate); No. 11 has the appearance of being feldspathic vein material, much altered and impregnated with limonite (iron oxide) and a little green copper carbonate; No. 12, Malachite; No. 13, group of quartz crystals stained dark red by iron oxide; No. 14, Malachite, (green copper carbonate), Azurite, (blue copper carbonate), and Chrysocholla, (green copper silicate); No. 15, Wulfenite, (lead molybdate); No. 16, a much decomposed Quartz-porphyry.

Consul Worman forwards from Three Rivers the report of the Canadian agent at Christiania, Norway, on two important inventions in connection with the iron and steel industry. The inventors, Mr. Grondal and Mr. Kjollen, engineers, have found new methods for producing iron from the ore. By Mr. Grondal's system the ore is crushed to fine dust, and iron is drawn out by the aid of strong magnets, after which it is moulded into brick forms. Mr. Kjollen takes for the same purpose electric power. An organized company, which owns his patents, has made contracts with French, German and Italian firms for the use of the method for a production of three million tons of steel and iron per year. Similar agreements have been made for the Grondal method with several important companies, Krupp, the cannon manufacturer, being one of them.—American Manufacturer.

Sampling With a Churn-Drill.

Written for the Mining and Scientific Press by Matt. W. Alderson.

My attention was called recently to a mining property which made a large surface showing of low-grade ore. The appearance was that of the outcrop of a blanket vein, or possibly a broken-down portion of a large lode. There were several shafts on the property, the deepest about 30 ft., which was as far as one could go with a whim because of water. To sample properly the surface showing would mean many holes, and drill-

POWER FOR THE DRILL.

holes would be the most economical and give a more perfect sample. No core-drill of any kind was available in the locality; the ore was of a kind that would not be hard to drill, and it being possible to point all the holes downward, therefore it seemed to me that the deposit might be sampled and the lay of the ore determined by the aid of a churn-drill. Acting on this view, a well-drilling outfit in operation one hundred miles away was secured and brought on the ground.

This drill was of the hollow-tool type, the cutting bit being attached to a line of pipe drill-rods, through which the drillings were brought to the surface continuously by pumping, there being a leather valve at the connection between the drill and the pipe-stem. In the operation of this drill it was possible to determine just the kind of material that was being passed through at any time. A water-box stood at one side, and in dry ground this was kept filled so that a small amount of water ran into the hole, thereby supplying both the drill and pump. Where the ground was compact, little water was needed, and when the drill reached the groundwater no more was required, the operation being continuous. Where the formation was open, the water would go out of the hole as fast as it was poured in. In this case the drill-stem filled with solid drillings; it became necessary to remove them so as to get a sample, and there was danger that this sample might

OVER THE EDGE OF THE SHAFT.

be imperfect. However, where water stood in the bottom of the hole the pump worked so perfectly that only an ounce or two of drillings was found in the stem when it was removed. The drill had a drop of ten inches. When the horses were allowed to take a lazy gait the speed was 50 drops per minute; but they had been trained to step lively and the drops averaged 70 to 75 per minute.

To catch the drillings, an ordinary five-gallon kerosene can was set in the water-box, and this was replaced by an empty one as often as it was desired to take a sample. Thus in ground we were particular about, we took a sample every foot. Any material change in the ground which was being drilled would show in the color of the water; but, if I wished, I had only to hold something under the drill-hose and catch a few of the drillings to tell exactly what kind of rock the end of the drill was in. In hard ore the drillings settled instantly to the bottom of the can, and it was only necessary to pour off the supernatant water and dry the sample. Where the material was slimy and it was thought there might be ore in the slime, I could stir the sample thoroughly and then dip out a part of it, or place all the sample in pans on top of a stove for evaporation. I found that, by bringing what was in the pans to a boil, nearly all the slime would be precipitated. The extra water being poured off, the slime was soon dried and then sampled down to such size as it was desired to send to the assayer.

On one day only was any serious difficulty experienced because of the hardness of the material encountered. On that day three feet measured our progress. The difficulty was not in drilling through the rock, but because the drill bits soon lost their gauge, so that the next bit would not follow. Being present on the ground when this trouble occurred, when it was found impossible after resorting to methods usually successful to get a newly sharpened drill to within a foot of the bottom of the hole, I let a dynamite cartridge of three sticks down to the bottom of the hole (then 21 ft. deep) by the aid of fuse. On firing this the hole was sprung so that drilling was re-

OVER A PROSPECT HOLE.

sumed without difficulty. Later on, in the same hole, I fired two other charges of one stick each, one at the bottom of the hole and one four feet above. For these holes I used shorter fuse, to save time, and lowered the charge to the point desired by strong twine.

Experienced drill-men would say that such a machine as was used in this instance was not the best for work of this character, and I am not recommending hollow-pipe or self-pumping tools for rock that would be classed as hard for hand-drilling. Rope-tools are said to be best for rock of this kind where a churn-drill can be utilized. But there are times when one cannot get just the best thing, and he shows judgment and mechanical skill who makes a machine not intended for such work do it creditably and without injury to the machine itself.

The drill and necessary horses and men to run it were hired by the day at a price considerably greater than if the job had been of any length. Nevertheless, 200 ft. of 2½-in. holes were drilled at a cost of $2.76 per foot. The actual cost of the drilling was $1.65 per foot. The cost of bringing the drill on the ground and returning it, together with cost for oversight, assaying, etc., was $1.11 per foot. Our average per day was about ten feet. A better average than this would have been made on a long job, or on a job where fewer moves and deeper holes would be required. In drilling in hard rock with a churn-drill, one needs a number of sharp drills, as it is best to change frequently before the gauge is so worn as to cause trouble in making the next bit follow.

The experiment was a success in that the work was much more expeditious than shallow holes put down by hand. In several instances the drill was set over the edge of prospect holes and shafts, and work commenced from the bottom of these. (See accompanying illustrations.) In one hole we drilled 30 ft. below water. The sampling of this 30 ft. by a shaft would have cost more than the entire cost of putting down the 200 ft. by the aid of the drill.

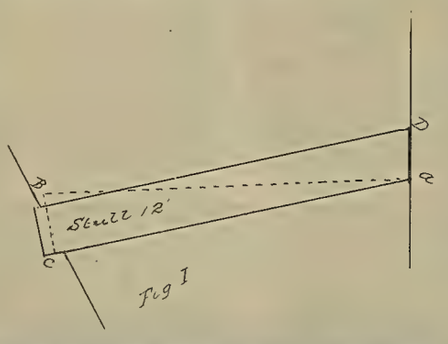
Underground Timbering.

Written for the MINING AND SCIENTIFIC PRESS by
R. B. NICKERSON.

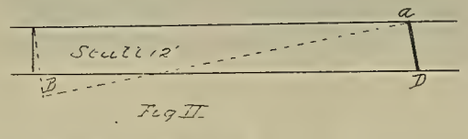
The timbering of heavy ground has been brought to such a state of perfection that, from a mechanical point of view, it can be safely asserted that any body of ore can be taken out, no matter what the conditions, or any piece of development done, no matter how difficult. The difficulties have all been overcome until now a first-class underground timberman will tackle anything and carry it through successfully and profitably too, if the pay is in the rock. Time was when rich orebodies were left or lost because the ground was too heavy to be worked. Nothing of that kind now. Long experience, modern methods and mechanical ingenuity, removed all that, and today, the right man will work anything underground. Most of those who do this kind of work are uneducated, and never learned a trade nor is it necessary that they should. What they need most is a good mechanical head, and years of underground experience. Some learned the carpenter's or millwright's trade, and this helped them, as sooner or later a timberman must learn the ways of the square and compass; but again, while learning their trade, they were missing the opportunities for observation of the tool-nipper and powder-monkey. The timberman of today has quite an array of different systems to call to his aid, and he uses the one he considers best to meet the conditions as he finds them. Here is where his experience and judgment come into play. From the simple stull, post and head-board to the elaborate square-set system, with all the different sprag and girth modifications of the same, he uses the one he thinks will best meet the requirements of safety and economy. It is constantly a question of safety versus economy underground, for if bodies of ore cannot be taken out with profit, the days of the mine are numbered; further, it is not only necessary to hold the ground and take out the ore with profit, but the cheapest system of timbering consistent with safety and good mining must be used. This is the idea of the caving system, whereby large bodies of ore are safely worked out and a minimum amount of timbers used. Timbers cost money; they represent a goodly proportion of the monthly expense account, not only the original cost of the sticks, but the expense of framing, getting them underground and through the stopes, setting up, blocking, etc. If the best system is economically used, they are a necessary expense; if not, there is a great waste. In low-grade mines, where the margin of profit is small, the expense of timbers and timbering makes a large sum total in the expense account. The careful foreman, shift-boss and timberman should, therefore, use his best judgment as to the system employed in timbering every individual stope, for in the same mine there is often a great difference in the character of the ground in the various workings. Simple stulls or post and head-board would do for one stope where a system of sets of large timbers would be necessary in another, and in another opening, while possibly requiring sets, the ground could be held by much smaller timbers, thereby effecting a saving in the size of timber used. Miners are naturally prone to extravagance in the matter of using timber. Danger is always present and they want to be on the safe side. But there is a wide scope between what is actually necessary and extravagant waste. In the matter of fore-poling, it frequently happens that two or three poles or lagging would hold the back, but it is such an easy matter to slip them in under the bridge and tail them, and the set looks so snug and neat that unless the miners are constantly watched and reprimanded, they will get into the habit of doing it, and do it right along, and this is a big leak. Good paying mines are more prone to extravagance than the ones where it is nip and tuck to meet the expense account. Miners will say, "Oh, what in hell is the use of being so damned cranky, she is paying anyhow." But I say, stop the small leaks; it is often a matter of life and death to a mine that might become a valuable property, a credit to the operators and a benefit to the country at large.

In the course of mining work, it often becomes necessary to run an old filled stope to use the waste to fill some other working stope. It is a good plan to go up in the old stope, if possible, and see how it looks, how the timbers held the ground, etc., and if the best system of timbering was used. Valuable ideas are often to be obtained in this way. It might be that above the vein of ore and the casing of gouge there was several feet of ground mistaken for the hanging wall, and lagged and timbered at great expense, while just above was the main hanging, hard and firm. Had this been known, the stuff above the vein could have been gouged out and the stope filled with it, and the rock taken out at much less expense. The point is to find this out before an expensive method of timbering is adopted.

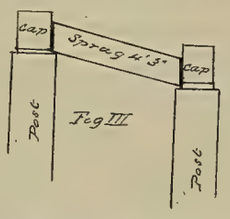
All heavy mines should be equipped with a small saw-mill plant, including a cut-off saw, a timber-framing



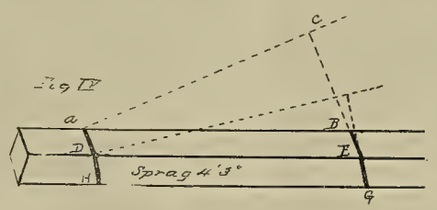
machine and a small saw for making wedges. Not only will the saw-mill cut all the lumber required on top, but the timbers can be cut to the proper size to do the



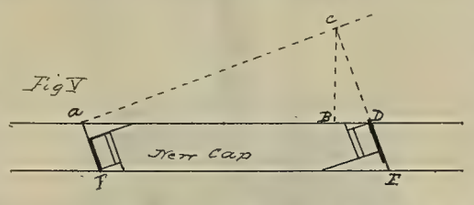
duty required of them underground, while the outside slabs can be made into poles, lagging, plank, etc., and the waste stuff made into wedges. The use of poles



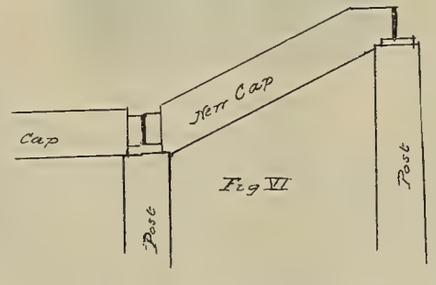
supersedes the more expensive method of shorter lagging and false sets. In using lagging in bad ground they are first worked ahead about 2½ ft. over the cap



and sides of posts. The breast is then worked out and hitches dug and a light false set put in. The false set then supports the lagging, which is again driven ahead;



the ground is then worked out and a main set put in. But frequently, after the false set is in, the lagging is driven ahead with difficulty, as the ground settles



heavily on them. In using poles, they are worked ahead full length, and well tailed; this will usually support the ground until the next set goes in. Poles are also an advantage where machines are used, as, when sets are placed 5 ft. from center to center of posts, a 5-ft. round can be drilled.

In taking the measures for timbers underground, many different methods are employed. The timbers must be framed to fit the ground and as the ground lies in every sort of shape, it is constantly necessary to take many difficult bevel measures. Some of the systems are complicated and require a thorough knowledge of angles to use them. Others are more simple. The following will illustrate one method which, while it is not claimed to be the best, is simple and accurate. Say that a stull is required with a beveled head (Fig. 1). The timberman taking the measure, first gets the length of the stull, which we will say is 12 ft.; he then places his slide-staff at a right angle to the hanging wall, A B in the diagram, and measures the distance B C, which we will say is two feet. This he calls the 'fly.' If he thought the ground required a 16-in. stick of timber his record of this measure would be:

900 Drift.

16-in. stull: 12 ft. long; 2 ft. fly.

It is a good plan when a mine requires two or more timbermen, for them to take turns at taking the measures underground, one staying on top to frame the 'rush' orders. Miners try to get their hitches dug as soon as possible, then send for the timbermen and busy themselves working out the back, putting up staging, etc., until their timbers come. If the miners were waiting for their stull, he would write the words "Hurry up" on his memorandum of the measure, sending it up on the skip to his partner, who would frame it in this way. He would roll a 16-in. stick on the skids, measure off 12 ft. on it. The line A C in Fig. 2. Taking his slide-staff, he would lay one end at the 12-ft. mark, illustrated by line A B; then take another staff and lay it at right angles to line A B, at the point B, two feet (the fly) from point C, and draw line C D across the stick, which would be the head bevel required. Suppose it is required to cut a sprag for two ordinary sprag sets, where, for some reason or other, one set is higher. This would require a bevel both head and foot as shown in Fig. 3, and the timberman's notes would read, if he needed a 10-in. stick:

10-in. sprag;

4 ft. 3 in. long; 12-in. fly, head and foot.

But suppose one set was not only a foot higher than the other, but there was an offset of a foot and a half, that is one set was 18 in. farther laterally in the wall than the other (See Fig. 4), then his notes would read: 10-in sprag; 4 ft. 3 in. long; 12-in. fly, head and foot.

Double bevel. 1½ ft. flare, head and foot.

He would use the word 'flare' instead of 'fly' in the second bevel to indicate to his partner that there was an offset in the timbers and a double bevel was necessary. His partner would understand it at a glance and could frame the stick as accurately as though he had taken the measure himself. He would frame it as seen in Fig. 5. He would take a 10-in. square stick, mark off 4 ft. 3 in., as A B in Fig. 5; place his staff at point A; measure his 1½-ft. flare at C and mark the line B E across the stick at right angles to A C. Then mark the line A F at right angle to A C. This would be his flare bevel. He would proceed the same for his fly bevel taking a foot fly from point E and marking E G and F H across the stick. He would then saw it at these marks.

Suppose that the hanging wall on a flat ledge suddenly rises and then takes its course again. It would not do to change the pitch of the post so a bevel must be put on the horns of the cap as in Fig. 6. The timberman taking the measure of this set would write the name of the stope—and, by the way, all large stopes sooner or later get a name which sticks, such as Cannon Ball stope, Powder stope, Klondike stope, Nigger Heaven, etc. So the timberman taking the measure would write:

Cannon Ball Stope;

Post, 8 ft. 10 in.; cap cocked up 3 ft.; sprag, 4 ft. 4 in.; 3 ft. fly. Hurry up.

When his partner on top gets this order, he knows that it will be longer than the regulation eight feet, so he cannot draw on the stock of caps already framed. As it is a rush order, he rolls the proper sized stick onto the skids and proceeds to find out the length of the cap as indicated by Fig. 7. He takes a staff and lays it across the stick eight feet (the regulation length cap) from end of the stick C G. Then he measures three feet on this staff from the stick C B (the height the cap is cocked up), and places another staff from C to A. He then moves his first staff C G to C E, placing C E at right angles to A C with his square. He then marks A F and D E, and saws this off—which is the length of the new cap. He proceeds to frame the horns of the new cap at right angles to A F and D E. His cap framed, he saws off his post 8 ft. 10 in. from a

stick framed ahead; champers the end, cuts his beveled sprag and the set is ready to go below. When in place, it will look like Fig. 6.

More illustrations could be given, but this is sufficient to show that any bevel can be cut by the use of this system, and two men, working to advantage, can turn out a great deal of good work—taking their regular turns to go underground—rushing their "hurry up" orders and framing caps, sprags, and the ends of timbers for posts during slack times, so as to be in readiness when the rush comes. The system has this advantage; you are working from the long end, like that gained by a peep sight on a rifle or looking through a long telescope, as a slight mistake in the 'fly' of a 12-ft. stull or a long stringer would not make any material difference in the end bevel. But a slight mistake in the angle taken of a 6-in. horn would make a bad fit for the cap. Again, the measure can be taken from the ground, which is quite an advantage when measuring a long stull; as compared to placing a ladder to take the angle of the hanging wall.

Madagascar Mining Laws.—Consul Hunt reports from Tamatave that a French decree has been promulgated announcing new gold-mining regulations for Madagascar. The changes lay stress upon the essential difference between a prospecting permit and a mining permit, but reduce the area from a radius of 2 to 1 kilometer (0.62137 mile), and impose a charge of $4.82 instead of $19.30. Mines are divided into alluvial and reef classes, taxed as follows: The 5 per cent ad valorem tax on the output is retained. In the case of alluvial mines a surface tax of $0.38 per hectare (2.471 acres) will be imposed, and for reef mines a tax of $19.30 per hectare. The Government also retains 5 per cent of the net annual profit above $48,250. On the other hand, the 5 per cent tax on the output will be reduced or altogether suspended in the case of those reef mines where the expenditure during the earlier working stages absorbs the whole of the output. Finally, the interests of holders of prospecting and mining permits are safeguarded by temporary measures which provide for progressive application of the financial regulations imposed by the new decree. The consul forwards the complete translated text of the Madagascar gold-mining laws, which can be seen at the Bureau of Manufactures.

The refining of cyanide precipitate is of some importance, owing to the well-recognized losses taking place in the ordinary methods, which are from two to six per cent. The following is a description by C. W. Merrill of the process used at the Homestake mine at Lead, South Dakota, in which the loss is less that 0.1 per cent: The precipitate, after removal from the presses, is treated first with dilute hydrochloric acid in a lead-lined mixing-tank, equipped with a mechanical agitator, a hood, and a powerful exhaust fan. After agitation and settling, the supernatant liquid is forced through a filter press by air pressure. Sulphuric acid is then added, agitation begun, and the mixture heated. It is then settled and the supernatant solution put through the press, as in the case of the hydrochloric acid. Wash-water is then added to the mixing-tank and the whole mixture put into the press, where it is further washed. The aggregate value of the acid-liquors and wash-water flowing from the press is less than $20 from $50,000 worth of precipitate. A portion of this value is recovered from a large settling-tank, into which the effluent solutions flow, and the remainder constitutes the only loss we have been able to find in this process of refining.

The resultant acid-treated precipitate is then removed to a large steam-dryer, where a part of the moisture is expelled, but never all, and the precipitate mixed with litharge, borax, silica and powdered coke. When thoroughly mixed, it is sprinkled with a solution of lead-acetate and the whole mass briquetted under a pressure of 4,000 to 6,000 lb. per sq. in. The zinc having been removed and the briquettes having been dried, a borax-slag develops upon the outer surface upon being charged to the cupel, and they fuse quietly, quickly and at a low heat, without dust or volatilization losses. The lead absorbs the values, sinking to the bottom, and slag is tapped off. All of the slag having been removed, the lead is cupelled off as litharge, and the resultant metal, 975 to 985 fine, is ready to run into bars. The cupel-slag and the cupel-bottom are then put through the blast-furnace, the lead-content of the slag reduces to lead, which absorbs the values, and is drawn from the lead-well in the usual manner. This lead is returned to the cupel at the next clean-up, the litharge from the cupellation goes to the next precipitate, and the blast-furnace slag is worth less than $5 per ton.

A Wood-Burning Assay-Furnace.

Written for the MINING AND SCIENTIFIC PRESS by EDWARD H. NUTTER.

To those engineers who are operating mines in localities where freight rates make the importation of assay fuel inadvisable, and where a fairly cheap supply of wood can be obtained, the following notes on the performance of a wood-burning assay-furnace may be of interest.

This furnace is what is known as the two-muffle tile furnace, and was furnished by the Denver Fire Clay

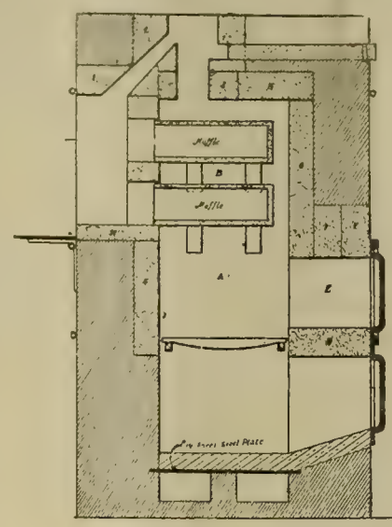


FIG. 1.

Company. Its construction can be seen from the accompanying illustrations. Instead of the fire-box and passages being lined with fire-brick, they are lined with thick tile made of fire-clay and molded to shape, which

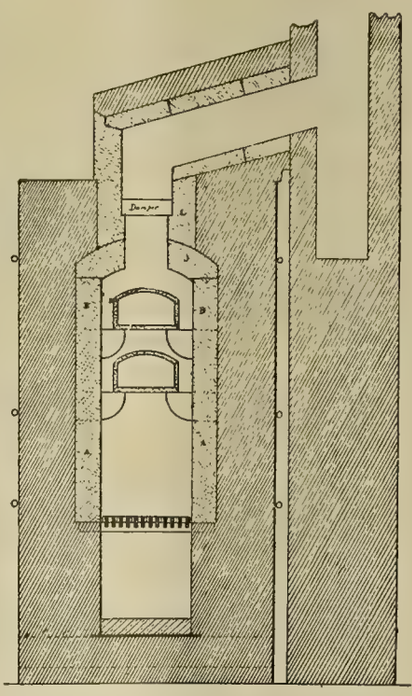


FIG. 2.

cheapens the construction. The furnace was installed in the assay office of the Standard Consolidated Mining Company, at Bodie, California, at the beginning of the present year, and has been in nearly continuous operation since then.

Prior to its installation, melting and cupellation were done in separate furnaces, using charcoal for fuel. The charcoal was made from nut-pine, and was furnished by the Chinese burners for $0.235 per bushel of 1.25 cu. ft., landed at Bodie. Last summer the Chinese who had been furnishing the charcoal decided to raise the price to $0.25 per bushel, and so it was determined to try a wood-burning furnace, for petroleum or its products to do the same work would cost a good deal more delivered at Bodie than the charcoal at the increased price. Bodie is situated in Mono county, about 100 miles from Carson City, Nevada, the railroad shipping point since Hawthorne was left off the railroad, and the wagon-haul from Carson to Bodie costs $1 per 100 lb. for all classes of freight. The furnace was ordered in August, but on account of the freight congestion due to the Tonopah-Goldfield rush, it did not reach Bodie until December, and was not erected until the middle of January.

The wood available for use in Bodie is 'bull-pine' cord-wood (a soft, punky pine, and about the poorest fuel one could find), 'bull-pine' limbs with the bark on, (which is a good deal better), and nut-pine, which is a good grade of 'pitch-pine.' On account of the uncertainty of the supply of nut-pine, it was decided to try limb wood. This, cut in two-foot lengths for the furnace, costs $6.50 per cord, delivered.

It naturally took the assayer a few trial heats to learn the characteristics of the furnace and how to regulate it; but after this was done the results were beyond our expectations.

In the charcoal furnace the crucibles were set on an iron plate, 15 at a melt, and charcoal was packed all around and on top of them. The first melt, starting with a comparatively cold furnace, would take about 45 minutes, while subsequent melts would take a little less than 30 minutes. In the wood-furnace, the muffles, which are Denver UU size, hold twenty 20-gram crucibles each, but this is too many to run, as the charges in the front crucibles will not melt down. The best number for a charge has been found to be from 12 to 16 in each muffle, and if the front parts of the muffles are filled with charcoal or coke, the first melt of from 24 to 32 crucibles can be finished in about an hour, and subsequent melts in about 35 minutes. Cupellation takes about the same time as before. Besides its larger capacity, the furnace is cleaner and more convenient to operate than the charcoal furnace.

With an average run of about 30 assays per day, eight bushels of charcoal, costing about $1.88, were formerly required to melt the charges and cupel the buttons. With the wood furnace, during a period of about two months, an average of one cord of limb wood per week was burned for approximately the same average number of assays. The cost, therefore, for wood was $0.93 per day during this period, and an average saving of $0.95 per day was effected in fuel with the use of the muffle furnace. An additional saving is made in crucibles and crucible covers, as the latter are not used at all, and the former last twice as long, on an average, when used in the muffles as they did when placed directly in the burning charcoal. While this saving can be determined only approximately for the short period that the furnace has been in use, it is not less than $0.15 per day. The increased cost of muffles can be determined only approximately, for such a short period, but so far this item has amounted to about $0.10 per day. There has resulted, then, from the operation of the wood-burning furnace a net saving in fuel and supplies of close to $1 per day.

The total cost of the furnace, installed, was $370.77. This included the expense of excavation and of a wood-shed. The cost, of course, would be much less in a less remote district, as the freight on the furnace from Denver to Bodie amounted to nearly three times the price of the furnace at Denver. It will be seen, then, that as an expenditure of $370.77 has resulted in a saving of $1 per day, the furnace was a good investment.

The fear, which was at first entertained that from the combustion of the wood available for use here a sufficiently high temperature could not be obtained for melting the charges to a good, thin slag, has proved to be groundless. I venture to say that almost any sort of medium-grade wood can be used successfully in these furnaces for assaying, as there is probably not a poorer grade of wood used any place than the variety of pine used in the instance described.

Hudson Bay.—William Beech has returned to Winnipeg after an extended prospecting trip on the shores of Hudson Bay and reports important discoveries of minerals. Within a few miles of Fort Churchill there are valuable plumbago deposits. Mica abounds in some of the rocky districts where both the white and brown varieties are found. Six miles from Fort Churchill, Mr. Beech found iron ore on the shores of the bay, samples of which he procured for analysis. He is the first man to stake out a mining claim on Hudson Bay and register it with the Dominion government, having located deposits of mica, iron and plumbago. The Hudson Bay factor showed him samples of gold which had been brought in from time to time by Eskimos and explorers, and he learned that copper abounds in the vicinity of Chesterfield Inlet, where it is chopped out of the rock in large chunks by the natives. Others are prospecting in the same region. Mr. Beech returned part of the way on snow shoes and the remainder of his journey by a Hudson Bay Company dog train. He will return and prosecute further researches when navigation opens.—American Manufacturer.

Special Correspondence.

LONDON, May 2.

The directors of Dolores, Ltd., have issued a circular containing the particulars received from Dolores Mines Company, for the six months, July to December, 1905, showing the monthly totals of crude ore milled, the average assay-values thereof, the average values recovered therefrom and left in the tailing, and the operating costs per ton with analysis of same under the customary heads, together with a statement of the total receipts and expenditures on revenue account for the seven months to January 31, 1906, audited in New York, of which the following is a summary:

Total Receipts:

On Bullion sold from treatment by amalgamation only of 4117½ tons crude ore milled	$267,996.70	
Sundry	1,548.67	
		$269,545.37

Total Expenditures:

Mining	$15,315.53	
Reduction works	39,009.91	
Bullion shipping	21,807.36	
Office and general	23,805.75	
		99,938.55
Total net profit at the mine (7 months)		$169,606.82

The average recovery per ton (amalgamation only) is seen to be slightly over $65. The monthly average gross value left in the tailing for treatment by the cyanide plant, when ready, ranged from $48.57 to $26.14 per ton. The highest monthly average gross assay-values per ton were: Gold 2.80 oz., silver 93.70 oz. and the lowest 1.56 oz. and 65. oz., respectively. Taking November as a specimen month when the largest quantity was put through the mill, the operating charges amounted to $17.77 per ton, made up of development $0.01, mining $2.38, amalgamating $7.20, administration $1.77, maintenance $0.08, general $2.24, shipping and selling (bullion) $1.82 and duties plus taxes $2.27.

With regard to mine development, the report states that during January the third (lowest) level was advanced north 30½ ft., the face sampling for the month averaging $89.64 per ton for a width of 5 ft. 10 in. At the end of the month the face showed assays of $129 to $318 per ton. The same drift was advanced 24.3 ft. in February, the face sampling showing an average assay of $180.88 per ton over the width of 4 ft. 9 in. During February the main shaft was sunk 10.1 ft., the ore coming from this giving an average assay of $22.18 per ton.

The record of mine extraction for January shows an average width of ore in the seven blocks in course of stoping, of nearly 7 ft., and for February the average width shown in the five blocks stoped is nearly 8 ft. It is pointed out that these averages of actual stoping widths compare with 4.7 ft. and 5 ft. respectively, as estimated for the same blocks in the original valuation of the ore reserves, also that as compared with the original valuations of $42 per ton average, the dump is also showing up well. In January the 230.1 tons of dump ore sent to the mill averaged $70.83 per ton, and in February 86.17 tons milled averaged $86.49 per ton.

The directors of Esperanza, Ltd., in issuing their second annual report, covering the period from November 1, 1904, to December 31, 1905, congratulate the shareholders on the phenomenal yield of gold which the Esperanza Mining Company has obtained during that period, and also on the rich returns which the consulting engineers indicate will be recoverable in the future. In this same period dividends were declared amounting to £375,375, equivalent to 82½ per cent on the capital of the company, and the directors state that very much larger dividends may be looked for during the current year.

The balance sheet of the Esperanza Mining Company shows assets readily realizable after providing for current liabilities of $2,451,969 including undivided profits at December 31, 1905, of $2,159,988.74, out of which the final dividend for the year, absorbing $1,203,750 has been paid. The sums of $239,141.58 spent on construction (including the recent complete electrical power equipment at the mine), and $61,392.60 for prospecting on the Suceso property, amounting in all to $300,534.18 since the formation of the Company, have been entirely written off revenue. The directors invite attention to the extraordinary developments which have occurred in the mine during the period under review. On June 15, 1905, Mr. Harold A. Titcomb made the first interim examination of the ore in reserve on these veins, and reported a profit in sight amounting to $1,881,000. On August 30, 1905, Mr. Cortlandt E. Palmer made the second interim report and advised the net profit on the ore reserves in sight as $5,621,338, and a further $2,611,577 as probable ore reserves. From the annual report of the consulting engineers it appears that they estimated on December 31 there were 127,240 tons in reserve, which should yield a profit of approximately $5,261,110. No estimate of the value of probable ore reserves has been made in this report, but recent developments point to the probability of opening up further extensive ore deposits, not only in direct continuity with those already being worked, but in other parts of the mine as yet only partially explored.

The audited statement of accounts for the period mentioned shows a profit of	£384,143.0.6	
To which is added the amount brought forward from last account	2,122.0.7	
Making a total of	£386,265.1.1	
This amount has ben appropriated as follows:		
Dividend No. 4, Feb. 11, 1905, 6d. per share	£ 11,375	
Dividend No. 5, May 15, 1905, 6d. per share	11,375	
Dividend No. 6, August 16, 1905, 6d. per share	11,375	
Dividend No. 7, Nov. 14, 1905, 6d. per share	11,375	
Dividend No. 8, Nov. 14, 1905, 4s. per share	91,000	
Dividend No. 9, Jan. 22, 1906, 6d. per share	11,375	
Dividend No. 10, Jan. 22, 1906, 10s. per share	227,500	375,375.0.0
Provision for income tax on dividends paid to English shareholders on No. 4 to 8		3,584.12.9
Leaving a balance (which it is proposed to carry forward) of		7,305.8.4
		£386,265.1.1

The actual value of the bullion extracted from the mine for the 14 months under review, is reported at $5,341,867.

Since the issue of the annual report the following particulars relating to the current year have been published, as received from the Esperanza Mining Company:

	Jan. & Feb.	Mar.
Tons of dry ore crushed	26,008	13,647
Shipped to smelter	11,123	4,713
Tons of dry ore:		
Value of Bullion produced	$263,242	$130,442
Value of Concentrate	81,546	59,696
Value of Ore shipped to smelter	851,450	332,284
Sundry receipts	284	1,492
Working expenses and depreciation	506,296	234,426
Profit at the mine	690,226	289,488

The London office note appended to the March report refers to the difficulty arising out of shortage of railway-cars, as continuing in aggravated form, the diminished tonnage being entirely owing to this fact.

The directors of the Mexico Mines of El Oro in a report which they have just issued state that Mr. R. M. Raymond has advised that, in view of the highly satisfactory development which has taken place during the past six months in the No. 5 and 6 levels, he is of opinion that the amount of ore now exposed in the mine fully justifies the immediate erection of a 20-stamp mill, having a crushing capacity of 100 tons per day, and suggests that a little later it may be advisable to add 10 or 20 more stamps to the mill he now proposes to erect, thus doubling its capacity. The developments at the No. 5 level have been extremely satisfactory; in the course of the drift north it has encountered, in a section of the vein which was barren in the upper levels, an orebody which has so far been proved for a length of 130 ft., having a width of 20 ft. and giving an average value of $20 gold and 9 oz. silver per ton. This drift is now entering the extensive orebody which was developed in a northerly direction in the levels above, with every indication that it will be found productive on the No. 5 level. Not having succeeded in making arrangements as formerly contemplated, with El Oro Mining & Railway Co. for the use of their mills, the directors have decided, in accordance with Mr. Raymond's advice, upon the immediate erection of a 20-stamp cyanide mill, with tube-mills and other modern devices, which are necessary to insure high extraction from the ores of the Mexico mine. The report states that in the meantime Mr. Raymond is proposing to ship to smelters a portion of the high-grade ore developed in the No. 3 and No. 4 levels, which has an assay-value of from $80 to $100 per ton, and the proceeds of such shipments, together with the present cash resources of the Company, will, it is estimated, be sufficient to carry on all development work and complete the erection of the mill without the provision of further funds.

The death is announced, after a short illness, of Mr. Matthew James Burn, formerly a well known figure in connection with West Australian, and more lately with Mexican, mining companies. Mr. Burn possessed a bright intellect, coupled with an engaging personality; he will be greatly missed by a wide circle of friends not only in this country but in the Colonies and the United States. His numerous clients were always able to look to him for safe guidance through the mazes of English company law and practice. The other partner in the firm, Mr. T. D. H. Berridge is one of the new Liberal M. P.'s, he having defeated Mr. Alfred Lyttleton, Colonial Secretary under the late Unionist Government, at the last General Election.

SALT LAKE CITY, May 7.

The shipments of ore from Tintic district last week amounted to 207 cars, the shippers being: Ajax, 3; Beck Tunnel, 6; Black Jack, 4; Brooklyn Consolidated, 4; Bullion-Beck, 13; Carisa, 5; Centennial-Eureka, 57; Dragon Iron, 9; Eagle and Blue Bell, 10; Eureka Hill, 10; Gemini, 31; Grand Central, 6; Lower Mammoth, 2; May Day, 7; Mammoth, 18; Scranton, 2; South Swansea, 2; Swansea, 4; Uncle Sam Consolidated, 3; Victor, 4; Victor Consolidated, 1; Yankee Consolidated, 6.

The Beck Tunnel Consolidated and Mammoth Mining Co., both operating in Tintic district, have declared dividends for May to the amount of $25,000 each.

The management of the Lower Mammoth mine, in Tintic district, has decided to sink the main working shaft to 1,800 ft., it now being down 1,200 ft. The winze below the tunnel, now down to the 1,600 level, is to be sunk 100 ft. deeper. Extensive bodies of shipping and milling ore have recently been developed on the 1,600 and other levels.

The Bingham Central Mining Co. has added the Bonham and Protection claims to its Bingham estate.

The governing board of the Salt Lake Stock and Mining Exchange has listed the active Nevada stocks which were called on the San Francisco exchange before the recent earthquake and fire.

The Boston Consolidated Mining Co. has a large force at work on the site of its new mill near the town of Garfield, Salt Lake county, which is to treat 5,000 tons of ore per day. The carpenter-shop and warehouses are well along in construction, and excavations are being made for the power-house, machine-shop and officers' mess-house. The excavations for the main mill-building will be started before June 1. The contract for the structural steel was recently let to the Minneapolis Steel & Machinery Company.

The construction of the new mill of the Utah Copper Company, at Garfield, is progressing rapidly. The steel for the first unit, which will contain equipment necessary to handle 3,000 tons of ore daily, is arriving. The power-house and lesser buildings are taking form, some of them being completed.

The Yampa Smelting Co. has placed an order for several additional MacDougall furnaces, making a total of eleven. In addition to this, there are two Edwards furnaces in operation. The plant will soon be equipped to treat 1,000 tons of ore daily. Changes made during the past year seem to have overcome many of the difficulties experienced in the past, and the plant is now being operated successfully and the company is making money—the returns being more than $100,000 per month, these figures having been given out recently from an official source. The company has secured practically all the land it needs for the building of a 12,000-ft. aerial tramway, which will connect the mine and smelter, and an order will soon be placed for this equipment. At present the company depends on the Copper Belt railroad for movement of ore.

Indications point to the rapid development of the Deep Creek district, along the western borders of Utah, the building of the Western Pacific railroad westward

toward San Francisco contributing largely to this end. Many prospectors have gone in during the past few months, and late developments, particularly in the Clifton section, have been of an important character. In the Gold Hill mine, owned by Salt Lake men, extensive bodies of copper ore have been developed. There are good reasons to believe that the great activity in western and southern Nevada is graduaHy making its way eastward.

A deal was closed in Salt Lake, a few days ago, whereby the Douglass group in Mason Valley district, of Nevada, which has produced extensively in the past, was purchased by Walter C. Orem, manager of the Utah Apex Mining Co. of Bingham, and Frank J. Hagenbarth, of Salt Lake.

The Big Indian copper mine, situated in La Sal mining district, in eastern Utah, has been bonded to Samuel Newhouse of Salt Lake. Auguste Mathez has been delegated to make an examination of the property.

The deal pending for sometime, looking towards a consolidation of the Comstock and California mines at Park City, has been consummated. A new company has been organized, to be known as the C. C. Consolidated. H. A. McCornick, is president; W. F. Snyder, vice president; S. A. Whitney, treasurer, all of Salt Lake. Both properties are fairly well equipped. the California having a mill of 100 tons daily capacity.

The Daly-Judge Mining Co. operating at Park City, has paid off $20,000 more of its improvement bonds, leaving only $80,000 yet uncancelled. Since January 15th last, $129,000 has been applied in reducing the bonded indebtedness. Besides, a little over $22,000 was used to wipe out an over draft. Ore shipments since the first of the year have netted between $40,000 and $50,000 monthly.

A mining deal was closed in Salt Lake a few days ago which will involve the transfer of the Lost Packer mine in the Loon Creek, Idaho, district, to J. A. Czizek of Salt Lake and associates. A new company, to be known as the Lost Packer Mining & Smelting Co. will be organized.

DENVER, May 12.

The matter which is commanding the attention of the Denver people at present is the question of granting or withholding franchises to the various public utility corporations. The Rush bill, under which a charter was granted to the city and county of Denver, provides that all franchises must be granted directly by the tax-paying voters. This is a good idea, but it has its faults. The trouble is that there is no way for the people to negotiate with the corporations. The corporations present a proposition. The people must either accept it, or wait another year and have the same turmcil all over again. There is no way provided for the people to submit a counter-proposition. The corporations take advantage of this fact and ask for more than they are entitled to. The tramway company is evidently paving the way for a coal-distributing scheme in the city. In addition, they make lurid promises about extensions, but when it comes to agreements in writing they nimbly side-step. The gas company wants 20 years more of clover and, some people think, they do not offer as much as they ought to in return.

There was a bad fire Friday, May 4, at the plant of the Colorado Glass Works. The plant was razed to the ground.

The American Smelters Securities Co. have ordered the mill at the Silver Lake mines at Silverton to be re-built. H. A. Guess, the manager of the property, says the new mill will be larger and better than the old one. It will be recalled that the Silver Lake mines made Edward Stciber in a financial way, and Edward Stoiber made the Silver Lake mines. Mr. Stoiber's death and the burning of the mill occurred practically at the same time.

The tonnage at Cripple Creek has fallen off considerably of late. This is due to a number of causes, prominent among which are the burning of the Portland shaft, the flooding of the El Paso, the exorbitant rates being charged on ore reduction and the interest being taken by Cripple Creek operators in Nevada mines. Those acquainted with the camp look for an increase in production next faH. One gratifying feature of recent development is the way new orebodies are being discovered in depth. The Elkton has just found a new vein which was unknown on the upper levels and the El Paso was developing a rich shoot on her lowest level when a water-course was cut that flooded the mine to the level of the drainage tunnel.

The Portland and Stratton's Independence seem inclined to lock horns in a lawsuit over some ore alleged to have been removed from Portland ground by Independence lessees. If the matter comes before the court some interesteing light may be thrown on the question of the extent of responsibility which rests on the mining company for the deeds of its lessees.

Leadville has developed a wonderful tonnage of medium-grade ore in the last few months and has also proved that the days of rich ore are not past, the Bessie Wilgus discovery being exceptionally high-grade. All that territory between the town and the Mesquito range is attracting the attention of mining men. The discoveries in the Yak, the Bessie Wilgus and in the properties along Big Evans gulch warrant the opinion that Leadville may surpass all previous records in the matter of production. Meanwhile Judge Owers and his associates are trying to prove that the other side of the camp is just as good or better, by sinking a deep shaft to reach ore disclosed by diamond-drill borings.

There is quite a big strip of mineral country on the other side of Mesquito range from Leadville and everyone wonders why the production is not greater. This summer's work may dispel all doubts, for it is likely that there will be a production consistent with the great extent of mineralized land and the favorable formation. From Hartzell to Dillon there is a continuous belt of mining territory and a small yearly output. When one considers that this belt is 45 miles long and 5 to 15 miles wide and that in it are some high-grade mines and also some large bodies of low-grade ore it seems as though the production should be much greater. The trouble seems to be that the big and continuous bodies are hard to treat and the high-grade ones are pockety. I must not give the impression that there are no profitable mines in the belt, because what started me on this line of thought was noticing the declaration of a $17,000 dividend by the London mine the other day, and there are several others that are large producers; but there ought to be more, and, as suggested above, there are two or three large enterprises afoot in this belt which may change the complexion of things. I hope to be able to publish fuller information later.

DENVER, May 10.

Clear Creek and Gilpin counties are securing more and larger investments in their mines than for years past. New enterprises are being started and properties are changing hands at a lively rate. Not only are the more recent discoveries in demand, but mines that have not been worked for years are being cleaned out and exploited.

Aspen capitalists have recently secured the Maggie M. group in Eureka district, Gilpin county, and intend developing, through the St. Anthony shaft now 170 ft. in depth. A hoisting plant has been installed and buildings are in course of erection.

It is reported that the Caledonia vein has been cut by the New National tunnel near Black Hawk. The vein was encountered about 2,200 ft. from the tunnel portal at 600 ft. in depth and is said to carry a large body of both milling and smelting ore.

The Banta Ranch mines of Gilpin county, owned by the Pleasant Valley Mining & Milling Co., have been idle for many years. Last fall work was commenced on transportation and milling facilities and carried forward until now the company has its 100-ton concentrating mill in operation. It has commenced shipments from the mines of smelting ore and is making concentrates of about a $30 grade at the mill.

The Gregory-Bobtail, Fisk and Cook mines of Russell gulch have been consolidated and the owners are planning to operate the consolidated properties on a large scale. These properties are credited with a gross output of about $20,000,000. It is reported that Chicago capitalists have purchased the West-Calhoun, Jefferson & Capital Prize mines located in Leavenworth gulch and Quartz hill. Active development of these properties will be started at once.

Nevadaville parties have commenced the development of the Silver Plate mine, associated with Wm. Thompson, the owner. The Silver Plate mine on the Thompson ranch, Eureka mining district, was discovered over twenty years ago and was chiefly famous for the fine specimens of silver nuggets it produced. The vein is small and carries high-grade silver ore, running from 800 to 900 oz. per ton.

The work of re-timbering the Cosmos tunnel of the X-Ray Mining Co. near Georgetown has been commenced. The Magnet group will hereafter be operated through this tunnel. As soon as the tunnel is timbered and connections made for ventilation a large production is expected from known bodies of ore.

It is reported that the Kelly tunnel near Georgetown will soon be started. The property has changed hands and the new owners have arranged to pay off the indebtedness of the old company and continue the tunnel, which is now 3,000 ft. in length, under Democrat mountain and nearing its productive area.

A contract of 5,000 ft. has been let on the Seaman tunnel, located on Fall river in Clear Creek county. The bore is to be 8 by 8 feet, and the agreement calls for 200 ft. driving per month. The Continental Mines Power & Reduction Co. projectors of the tunnel have ordered a plant of machinery consisting of 80 h. p. boiler, air compressor and air drills and suitable buildings are being erected.

The Seaman tunnel project, which has been under consideration for several years is of considerable magnitude. The portal of the tunnel is situated on Fall river at an altitude of 8,850 ft. The line of the tunnel projected for five miles, is toward James Peak and crosses the mining camps of Lombard, Alice and Yankee. It will cut James Peak over 5,000 ft. in depth.

While the estimates indicated that notwithstanding, the forced reduction of tonnage, of some of the large producers of Cripple Creek, the output would be up to the monthly average, the compiled returns show a falling off of 2,000 tons less than March production. The totals from treatment plants show 46,000 tons, valued at $1,370,900.

The Cripple Creek drainage tunnel enterprise is yet a matter of contention among mine owners and the date of starting the bore is postponed from time to time. It has been noted by some observers that a number of the drained mines, that is, those drained by adjoining deeper works have produced deadly gases to a greater extent than the wet mines. Under certain atmospheric conditions these gases issue from the courses and crevices from which water formerly came. At times parts of the mines have to be abandoned, temporarily, and until there is a change in the weather.

It is stated that the Dorcas mill which was destroyed by fire early in April will be rebuilt by J. M. and Frank Homer. The Dorcas mill, cyaniding plant located near Florence, Colorado, was generally believed to be operated independent of any trust and enjoyed a large patronage from lessees in the Cripple Creek district. It is said that the new plant will be housed in an all steel, fireproof building. The entire plant will cost about $300,000, and have a capacity of 200 tons daily.

A sale of the Suffolk-Globe group and 40-stamp mill of mines, near Ophir is pending. The prospective owners propose to spend $50,000 in developing the property and remodeling the mill. The mines will be operated through the Badger tunnel, which will cut the veins from 800 to 2,000 ft. in depth.

It is stated that the order to rebuild the Silver Lake mill near Silverton, which was recently destroyed by fire, has been countermanded by the American Smelting & Refining Co. It is believed that the fire was of incendiary origin, but no arrests have been made.

JOHANNESBURG, April 10.

Nothing approaching a panic has been caused by the recent troubles with the Zulus in Natal. The Liberal Party has added to its unpopularity in South Africa by its interference with Natal. The leading natives in the recent trouble were condemned to death for the murder of several white police. The Home Government interfered, and the Natal Ministry promptly resigned. Then the Home Government precipitously "climbed down," and the Natal authorities were allowed to deal with the guilty Zulus, whom they shot forthwith. Although the situation is considered serious, the white people of this country feel quite capable of dealing with it. The Zulu troubles in Natal have had no effect on the market, because, some say, it is in such a rotten state that nothing will affect it. The British are the most sentimental people in the world, and in their dealings with the black races of South Africa, there has been far too much kindness, and not quite enough of the severity characteristic of the Boers and the Germans. Just now sentiment must be put aside, and the recalcitrant natives dealt with severely. There are few Zulus employed on the mines of the Rand, so that the disturbances will not affect the labor supply here.

An annual meeting of considerable interest was that of the South African Land & Exploration Co., commonly called "Sallies," held last week at Johannesburg. "Sallies" had a most sensational run on the Stock Exchange some months ago, when the £1 shares went to £7 or £8. Today they stand at 17s. 6d. According to the chairman's remarks, their tin mine promises to develop into a profitable enterprise.

Tin is not the only base metal receiving attention. Copper and lead have come in for their share. As far as prospects are concerned, one hears of them every day, but whether they will develop into payable copper mines remains to be seen. There is one promising lead proposition on which a lot of work has been done. The budding base-metal industry is even more harmed by the uncertainty of the labor supply than the gold and diamond mining.

There have been two important developments lately.

The most important and most satisfactory is that of the Cinderella Deep, where the reef was encountered by the vertical shaft at a depth of nearly 4,000 ft. The assay-values show highly payable ore. This mine is under the technical control of Messrs. Denny, who will introduce some of their novelties in its development, such as conveyor-belts for handling the material on the inclines, etc.

At the Knights Central (a mine of the Central Rand) the reef has been found at a depth of about 2,250 ft., the assay-values being fairly satisfactory.

BUTTE, May 12.

The water problem, once a serious handicap and inconvenience to mining in the Butte district, is solving itself. Big Butte mountain, which several years ago appeared to be saturated with water, is being drained dry, and the amount of water that is now pumped from the mines is small in comparison with that of some years ago. All of the Anaconda mines are being drained through the High Ore mine, from which 1,000 gal. per min. are now pumped, where formerly five to six times that quantity was raised. The High Ore drains the Anaconda, Bell and Diamond, Wake-up-Jim, Neversweat, St. Lawrence, Sunnyside, Mountain Consolidated, Green Mountain and several other mines. Even mines in the lower part of Butte district, among them the Ophir, Emma, Belmont and Pittsburg, have only a small fraction of the water that they formerly had to contend with.

The East Butte Mining Co.'s main shaft, on the Dutton claim, has reached a depth of 400 ft., where a pump has become necessary. It is expected that a depth of 500 ft. will be reached within a month, when cross-cutting will be started. In two months the company will be able to hoist ore from the shaft, while sinking will continue to 1,000 or 1,200 ft. Mr. Wall, the manager, says the company will have a daily output of 500 tons of ore by the first of next year, independent of lessees. The latter are now mining a lot of good ore, on which they are paying a royalty of 25%. Lessees are also operating the company's concentrator and are working up the old dumps at the mines, which yield 2 to 4% copper. Some ore is being hoisted that runs from 30 to 35% copper. It comes from a four-foot vein in the Simons mine, which is also worked by lessees.

The smelter of the Montana Ore Purchasing Co. will not be shut up by the new owner, the Butte Coalition Co., but will continue to handle all the smelting ores from the Rarus, Minnie Healey, Corra and Belmont mines. The combined output of the four mines is about 1,500 tons per day. The Corra has become the company's principal producer, in point of quantity. A big vein was recently opened in the Corra and the output from the mine is increasing.

The South Butte Copper Mining Co. owns eight claims in the southwestern part of Butte district and has started sinking a shaft to 500 ft. It is claimed that there are several copper-bearing veins in the ground.

The Butte Copper Co., which is developing the Trifle and Anselmo claims in the western portion of the city, is running a cross-cut from the Trifle shaft to the Anselmo vein. In this work a lot of fine copper ore has been taken out. The shaft of the Butte & London Co. on the Greendale claim has reached a depth of 300 ft. and will be sunk to 1,200 ft. before exploration work is begun. The new hoisting plant, boilers and air compressor are being installed. The company has erected a number of buildings at the mine and has moved its offices there. No ore has been struck in the shaft, but there is a considerable flow of water, which, so far, the pumps have had no difficulty in handling.

New hoisting machinery is being put on the three shafts of the Butte & Bacorn properties.

In the Original mine, one of the Clark properties, the big vein, which has been cut at the depth of 2,200 and 2,400 ft. in the Anaconda, has been cut at 1,900 ft., where it is 20 ft. wide, and the ore runs high. The Original shaft is down 2,000 ft. and a cross-cut is being run from that point to the vein. The same vein runs through the Parrott and other ground lying between the Original and the Anaconda.

The North Butte Mining Co. expects to have its new engine and hoisting plant in working order in 60 days. All the machinery for it is now on the ground.

The shaft of the Butte Copper Exploration Co., on the Six O'Clock mine, has reached a depth of 550 ft. and is being sunk at the rate of 25 ft. per week, and will be sunk to 1,000 ft. before cross-cutting.

The vein recently cut in the Bertha mine, east of the Pittsburg mines, at a depth of 35 ft. in a winze, has also been cut in the bottom of the shaft at 100 ft. The two openings are 500 ft. apart, and shipments of ore are being made from both. The vein has been opened 80 ft. north and south. This discovery of ore in commercial quantities in the Bertha has stimulated mining on the east side.

The Butte & Veronica Mining Co., recently incorporated in Butte, owns 12 acres of ground west and south of the Belmont mine, owned by the Butte Coalition. There are two shafts from which samples of good copper and silver ore have been taken. One shaft is 70 ft. deep and the other 130 ft.

Mayor John MacGinniss, of Butte, and several associates have purchased the Copper Bell mine in the Cataract district of Jefferson county, and preparations are being made to work the property. The Copper Bell is situated seven miles north of the town of Basin near the Eva May, a mine that has been a producer for many years. The Copper Bell has been idle since 1894.

The East Butte Extension Co. made a shipment of 12 tons of ore a few days ago which returned 19% copper, 15 oz. silver and 40c. gold per ton, making a net return of $57 per ton. This ore was extracted by two men in five days. The Butte-Milwaukee Co. is sinking a shaft on the Florence mine, one of the two properties recently acquired. Lessees of the Pollock mine, an old producer, will be shipping ore soon. The North Butte Mountain Co. is sinking a shaft on one of its claims in the new district north of Walkerville. Two bars of gold have recently been shipped by the Cable Consolidated Co. and a bar weighing 135 lb. was shipped a few weeks ago. The Butte and Summit Valley Co. is exploring copper properties in Saratoga gulch, southeast of Butte, where a great deal of development work is being done by various companies and individuals.

CALUMET, May 12.

It is understood that the Calumet & Hecla Mining Co. has purchased the old Nonesuch property, in Ontonagon county, which was owned by A. K. Camp of Milwaukee, Wis., and others. Official information on the subject is unobtainable. The Nonesuch mine is the principal and pioneer property in the Porcupine Mountain district, and consists of a tract of one square mile at the southern end of the Porcupine Mountain copper range. Discovered in 1865, the mine was first opened in 1867. The lode is an argillaceous, conglomeratic sandstone. Numerous attempts were made to place the Nonesuch upon a paying basis in the early days of the Lake copper industry and many and varied were the schemes tried to save the fine copper which it carries. The property is said to be as rich in copper as the Calumet & Hecla, but the metal is very fine, something like the flour gold of the Western miner. Under Calumet & Hecla Co. management the Nonesuch is assured of a fair trial. The acquisition of property in Ontonagon county by the Calumet & Hecla Co. is highly pleasing to residents of that section.

It is expected that the Victoria mine will start shipping to its mill this month. Construction work on the mill was delayed by the non-arrival of materials. The Taylor hydraulic power plant at Glenn Falls is proving successful. Underground the Victoria management has been cutting out stopes the last few weeks and it is stated that the ore is better than was indicated by the character of ground penetrated in the drifts. With its water-power plant in operation, it is thought the Victoria should be able to mine and mill a ton of rock at less expense than any other property in the Lake Superior copper district.

The Northern Construction Co. has been awarded a contract for building a large warehouse, assay office, etc., at the Champion Copper Co.'s stamp-mill on the shore of Lake Superior. Excavating for the foundations of the new buildings is progressing. The new structures are to replace those destroyed by fire some time ago, when all the records covering the experimental work of the last few years were destroyed.

Surveyors in the employ of the Calumet & Hecla Mining Co. have been at work the last few days on the property recently acquired by that corporation northeast of the Mohawk mine, and it is understood that an early start will be made in exposing the Kearsarge amygdaloid bed at that point. The lode passes through five forties of the property. Some of the Eastern officials of the company have recently looked over the ground. The tract includes 240 acres, lying northeast of the Mohawk, and adjoining the Seneca, owned by the Bigelow syndicate. The ore in the Mohawk's northernmost shafts is reported to be excellent, and it is probably this fact that influenced the Calumet & Hecla in its acquisition of the property. The development of these lands will be highly important to the Seneca and may lead to the inauguration of activity there within the next year or so.

Construction work on the new steel shaft and rockhouse at No. 3 shaft of the Wolverine is advancing rapidly. The Wisconsin Bridge & Iron Co. of Milwaukee, Wis., has the contract. The structure will replace that destroyed by fire a few weeks ago.

MINING SUMMARY

ARIZONA.

COCHISE COUNTY.

The progress made at the mill of the Tombstone Consolidated Co. is exceeding expectations and is paying a royalty to the company. During the past month the cost for treatment of ore put through the mill was $1.50 per ton, which, when the remaining stamps are started, the management expects to reduce to $1 per ton. At the present time a little over 100 tons per day is being put through which amount will soon be doubled. When the mill was started it was thought that the four Callow tanks would be sufficient to carry off the slime, but they were found insufficient and six additional tanks were ordered. These have been put in place and 20 more stamps can now be started. Several bars of gold and silver have already been shipped as the result of the clean-up and two cars of concentrate were shipped last month. The present system of milling is resulting in saving 90 per cent. The ore comes from the main shaft and is being taken from old stopes of the Contention and Head Center workings and it is said that there is enough ore in sight to keep the mill running for a number of years without further development.

A Los Angeles company has been formed to take a group of claims in the Johnson district, and has paid down ten per cent of the purchase price, and will start development. This includes the Teaser, Surprise, Hillside, and other claims. The group was formerly the property of T. K. Mitchell, K. Hart and others, and is situated in the center of the district. Kirk Hart will have charge of the work.

MOHAVE COUNTY.

S. C. Bagg, who has been cleaning out the Jennie mine on the Arizona side of the river opposite Eldorado canyon, has completed the work and will now begin development of the property. The shaft, which was filled up, was found to be 110 ft. deep, with a vein five feet wide between well-defined walls. Several drifts from 20 to 100 ft. long were cleaned out. The orebody ranges from two to five feet in width. Some of the ore remaining in the stopes assayed two ounces gold and 1,200 oz. silver per ton, while hundreds of tons will run $20 to $50 per ton. A contract has been let to sink a new shaft 200 ft. west of the old shaft. Twenty-five sacks of ore have been shipped to the Needles smelter.

A large body of high-grade ore has been found in the tunnel on the Victor & Virgin mines, which is being rapidly developed. These are among the oldest mines in San Francisco district but until lately there had been but little development work done. T. Ewing, the owner, will continue development. John Binschaedler has a contract for 1000 ft. of development on this mine.

YAVAPAI COUNTY.

At 562 ft. the Black Hills mine, near Jerome, has struck a body of copper-iron sulphide, and are sinking now in solid ore.

CALIFORNIA.

AMADOR COUNTY.

A. W. Aiken, superintendent of the Climax mine east of Jackson, says the ten-stamp mill is running night and day. The vein is 12 ft. wide in places, and the ore shoot 600 ft. long. It is low grade, but all of it goes to the mill.—— The Mitchell is being operated by the lien holders, who obtained judgment for their respective claims, in the hope of being able to secure enough to pay something on the indebtedness. There was a pile of rock, estimated at 700 tons, left by the lessees. This is being run through the mill, it is said with satisfactory results.

It is locally reported that the Fremont Consolidated Mining Co., near Amador City, will add 60 stamps to their mill, making a total of 100 stamps. Large low-grade orebodies are developed in the several mines of this company, and it is believed that additional stamp capacity will lessen the cost of production in all branches.—The Kennedy mine struck a heavy flow of water last week. At one point fully two inches of water is pouring into the workings. It is encountered at a point in one of the lower levels where the east and west veins form a junction. The foot-wall vein in the 2,700-ft. level has been opened and four feet of it is found to be of fair milling quartz.

Two brothers, named Garbarini, were injured while working in the Kennedy mine Monday of last week by drilling into a missed hole. One of the brothers will probably lose his eye-sight. The other man was less seriously injured.

CALAVERAS COUNTY.

J. J. Rutledge, of San Francisco, has purchased the Lucas mine near Mokelumne Hill, and has been operating the same for three weeks. The suspension bridge across the Mokelumne river at the mine has been repaired sufficiently to allow ore cars to run over it to a ten-stamp mill.

Good reports come from the Ariel mine. The shaft shows ten feet of milling quartz, free gold being seen. —— The mill at the Josephine mine was completed last week. It is now crushing good rock.—— The hydraulic operations of the Nelson Contracting Co., at Calaveritas, have been temporarily suspended owing to striking a large body of cemented gravel which the stream from the giant will not disintegrate. Arrangements will be made for a mill to crusn the cement. The gravel is rich and the mine has been paying from the start.

INYO COUNTY.

In the White mountains the Neylon group comprises nine ledges, ranging up to 100 ft. in width, and many smaller ones. The value of the property is in the large amount of low-grade ore available. The lowest return has been 41 cents, the highest $17. Many pannings have been made and not one has failed to show gold. The group covers the north and east slope of a hill in Piute canyon, ten miles northeast of Bishop.

The three-stamp mill of the Mount Whitney Milling & Mining Co. near Lone Pine is finished. E. Walker is reported to have found a vein of high-grade ore on Walker creek, south of Lone Pine. The Goldike Reef mine is reported to have opened a four-foot vein at the 100-ft. level, averaging $200 gold per ton. A strike is reported in the Golden Gate claim in the White mountains.—The Casa Diablo Mining Co., near Bishop, has made final payment for the Sherwin mines. B. F. Brazee, of Cleveland, is president of the company. A mill and cyanide plant are to be built and running before October 1. The seven-mile pipe from Rock creek will first be laid. Much will depend on this additional water supply.

SAN BERNARDINO COUNTY.

It is reported that the Rose mine, 60 miles east of Victorville, on the summit of the north range of the San Bernardino mountains, is to be reopened. The Rose mine was worked steadily for a number of years prior to 1897. The ore is principally hematite in limestone, at contact with mica schist. The property has been leased to H. P. Starboard, who will rehabilitate the property.

SISKIYOU COUNTY.

The Gold Nugget claim at Empire Creek, Klamath river, owned by Carter & Taylor, is showing good prospects. It contains many large boulders, which have to be blasted out. The bed rock has a covering of rich gravel, and is easily kept clear of water by a steam pump. The Freshour Bar claim, in Virginia Bar district, has been closed down temporarily.—— New digging buckets are being made for the Yreka creek dredger, the first lot having been worn down.

TUOLUMNE COUNTY.

(Special Correspondence):—An organization to be known as the Tuolumne Mining Exchange, the purpose of which is to foster the mining industry of the county, has been formed in Tuolumne. The organization will maintain a permanent exhibition of ores, keep a record of mining properties, procure up-to-date maps, and, in fact, have available such other things and information as would be of interest to mining men. It will also have a room for the convenience of its members and visitors, where mining journals and other literature will be kept, and where writing may be done. The officers are J. T. Thompson, president; E. C. Damin, secretary, and J. W. White, treasurer.

It is reported that operations will shortly be resumed at the Goldwin, near Tuolumne. J. L. Partz is superintendent.

The breaking of the compressor at the Sunnyside mine has delayed work in the tunnel. Repairs will be made and work resumed. The face of the tunnel is within a few feet of where the vein is supposed to be.

J. W. Richards, superintendent of the Louisiana, reports the water lowered to the 250-ft. level, leaving 70 ft. yet to be unwatered. Progress will henceforth be slower, as considerable stoping and driving was done below the present level of the water.

A tramway is being constructed at the Lucky Find mine, near Confidence, and the mill is being put in readiness for operation.

The Dondero gravel mine, near Columbia, has been bonded to Stockton people. It is claimed that for the past several months the mine has yielded on an average $125 per day, with but a few men.

A number of people from Cleveland, Ohio, are expected to arrive here shortly to inspect the Columbus mine, one mile north of Tuolumne. At the North Star mine, near the Columbus, a new head-frame is being erected and the shafe re-opened. It is 215 ft. deep and is partially filled with water. J. W. Phipps, superintendent, states that as soon as the water is pumped out drifts will be started, and when these are well under way sinking will be commenced. Five men are at present employed. This mine has been idle for years.

The mill at the Longfellow mine in Big Oak Flat, near Groveland, after an overhauling, resumed crushing a few days ago.

The Spring Gulch mine, for some time past operated by Messrs. Connally, Vargas & Lundell, Tuolumne people, has been bonded to Eastern capitalists and preparations for working the property are in progress. A 2,000-ft. tunnel is to be run from Hunter creek that will tap the vein at a depth of 1,000 ft. The steam hoist is being repaired, new skips have been ordered, and the mill, which was never completed, is being put in shape and will be started up as soon as it is ready. Development work has been done to a depth of 500 ft. H. M. Shaw is superintendent and M. V. Connally is foreman.

The Pennsylvania shaft of the Soulsby mine, at Soulsbyville, is down 550 ft. and sinking continues. Work of unwatering the Davidson shaft is nearly finished. It will be sunk to 500 ft. and connected at this depth with the Pennsylvania.

Tuolumne, May 14.

COLORADO.

CLEAR CREEK COUNTY.

G. E. Collins, manager of the California mine near Central City, has been appointed general manager of the Newhouse tunnel, succeeding J. J. May. S. A Knowles, who has been in charge of the tunnel since Mr. May's resignation, will continue as superintendent, he having a contract to drive the tunnel 4,000 ft. Mr. Collins will continue in charge of the California mine, which has the deepest shaft in this section of the State. The California vein will be intersected by the Newhouse tunnel at a depth of close to 2,000 ft., and with but a limited amount of driving, connection can be made with the main shaft. The California shaft is 2,231 ft. deep, there being 23 levels. At the present time no work is being done on the property, the water standing above the 1,500-ft. level. Aspen people are interested in the Maggie M. group in Eureka district under lease and bond and have made arrangements for the operation of the property from the St. Anthony shaft, which is down 170 ft. and adjoins the Spur Daisy mine on the east. Machinery has been installed and it is the intention of the lessees to sink this shaft deeper. The group has produced high-grade milling and smelting ore from surface workings, and less than a year ago local lessees took good ore from the Spur Daisy workings. George Maloney is in charge.

A big vein is reported cut in the main tunnel of the New National Tunnel Mining Co. below Black Hawk, during the past week. The vein was cut at a distance of 2,200 ft. from the portal of this tunnel and is believed to be the Caledonia vein. It has been cut at a depth of 600 ft. and considerable shipping ore is expected from this tunnel. Lessees are working on another vein cut in the main tunnel and they are taking out lead ore. The company are also operating the Caledonia property in Lake gulch which is on the line of the tunnel, and are drifting on the east 450-ft. level and taking out smelting and milling ore which they are shipping at intervals. Shipments of smelting and crude ores, tailing and concentrate from Black Hawk to the Denver smelters and other points were 3,550 tons for the past three weeks. Included in these shipments, outside of the regular heavy shipments by the Chamberlain-Dillingham Ore Sampling Co., were the following lots to the Argo smelter: One car of smelting ore by the Santa Loreta M. & M. Co. on Bobtail hill, two cars of concentrate from the O'Neill mine in Gregory district, one car of concentrate from the Clear Creek Mining & Reduction Co., three cars of concentrate by the Fifty Gold Mines Corporation, operating at Black Hawk, and one car of smelting ore from the Dump mine on Bobtail hill to the Globe smelter, one car of smelting ore from the Druid property, in Willis gulch, and four cars of ore from the Concrete mine.

SUMMIT COUNTY.

The Old Union mill is running steadily and making regular shipments of zinc, lead, and iron concentrates. The compay is also shipping first-class zinc ore from their main tunnel. The Wellington mine is also shipping steadily car loads of zinc and lead ore assorted at the mine. Its second-class ore is being treated at the Old Union mill.—— The Laurium mine and mill on Bald mountain, above Illinois gulch has been bought by a new organization known as the Blue Flag Mining and Milling Co. The mill will be in operation early next month and the supply of good milling ore now on hand in the mine warrants the erection of additional stamps which will be added.—— The 40-stamp mill of the Jessie Gold Mines Co. is undergoing an overhauling, and renewal of worn parts. When this is completed the mill will be started on the ore which is broken in the mine.—— At Frisco the Excelsior mine is still making shipments of high-grade silver ore. The Square Deal Co. is making a trial shipment of milling ore as well as a lot of smelting lead ore.

The King Solomon Tunnel and Development Co. has run through another lead vein in their main tunnel. This is the best orebody cut in this tunnel, and is six feet in width. The Mary Verna and North American Cos. are making good progress with their big tunnels.—— At Montezuma good work is being carried on in several of the principal properties.—— The Pennsylvania mine is making regular shipments of smelting ore via. Keystone, and has a large quantity of mill ore in the mill and mine bins awaiting the starting of the mill when sufficient water can be obtained.

The Sarfield property is being energetically worked and good grade shipping ore sent to smelters. Campbell and Finotti are taking out fine lead and zinc ore from the Fisherman.—— The driving of the main tunnel at the Wild Irishman is being pushed as fast as possible.——The Blanton, Jumbo, Little Jumbo, Silver Eagle, Clarion, and several other properties are also being worked.—— The Rothschild Tunnel in Cooper mountain is now in 3800 ft.——At Robinson substantial development work is going on. The Krenger-McCoy Co. is developing the Wheel of Fortune mine which in the past produced largely.—— On Sheep mountain the principal properties being worked are the Snowbank and Michigan.——In the Eldora mine, the extension of the Robinson mine, ore shoots are found which in places measure from 30 to 50 ft. wide.——The Bonanza group, belonging to the Robinson mines, is now being worked by the Summit Mining Company.

The Felecia Grace has a hoisting plant in position and the company is sinking to the second contact. This group comprises the Champion, Homestake, and New York, all of which have been big producers in the past.—— The Ten Mile Leasing Co. has the deepest workings in this camp and is worked by Leadville leasers.

McNulty gulch is soon to be the scene of placer operations. This is a famous placer tract where a pound of gold per man per day was a common-thing in the 80's. Other properties which will be worked this season are the Columbine, Canyon Point, Half Moon and Jersey Queen. Molybenum, nickel, cobalt and tungsten prospects are also to be opened up.

Breckenridge, May 1.

IDAHO.

LEMHI COUNTY.

The Butte & Idaho Gold and Copper Mining Co. is to operate on an extensive scale. This company is successor to the Schumacher-Olsom Mining Co. The ground consists of six claims, a tunnel site and mill site, situated at the head of the north fork of Carmen creek, and joins the Ajax mines of Montana on the west, part of the claims being on the line of the continental divide and the State boundary. The Butte & Idaho has 550 ft. of development, and has done much other work. Last summer they built two and a half miles of new wagon road up Davis canyon, almost up to the main tunnel. They have machinery for a five-stamp mill, and have erected buildings. John Mengel is developing the Gold Cliff ground of seven claims in Kirtley creek, which he has under bond. The main tunnel is in 130 ft., and a new tunnel is being opened to prospect another and larger vein.

SHOSHONE COUNTY.

Articles of incorporation of the Little Sister Mining Co., Ltd., have been filed with the county auditor. The incorporators are: P. H. Renshaw, Shoshone county, treasurer; E. H. Pattison, F. Markwell, A. F. George and J. W. Bates. With the exception of the last named, who is a resident of Denver, Colo., all the incorporators are Wallace men.

Directors of the Alameda Mining Co. have levied an assessment. The group adjoins the Success, and is said to be on the Success vein. In a tunnel run 600 ft. a vein of high-grade galena was cut two years ago. Now the company will sink on it. The vein was 20 in. wide where it was cut 275 ft. from the surface. It assays 65 oz. silver and 67% lead, with considerable zinc.—— The O. K. Consolidated has men driving on its 400 ft. level. August Matt of Wallace is secretary of the company. The O. K. is a few miles below Kellogg.

MONTANA.

JEFFERSON COUNTY.

F. Walker, who, with Albright, has a lease on the Oro Cache mine, has pounded out in a hand mortar several pounds of gold from the quartz taken from the Oro Cache, which is the property of the Granite Mountain Co. The Oro Cache is one of the oldest mines in the State and the hill of that name is known to every old-time miner in the State.

MADISON COUNTY.

A rich strike of free gold ore is reported from the Mountain View mine near Stirling, an old camp. A company is being formed at Pony to develop and operate the mine.—The mining outlook for Madison county is promising. There is more activity at present than for a number of years. Many of the properties are being operated under lease. At Silver Star much work is going on in the mines. The Green Campbell Co. has about completed its mill, and expects to have it in operation by May 10. This company has large bodies of ore blocked out. In the vicinity of Sheridan there is a large amount of quartz mining by the leasing system. At Sheridan, on Wisconsin creek, placer mines are in operation by a company of Chicago men. Work has begun on a new flume which will be 2,554 ft. long.—Francis Redfern will develop his mines in Ramshorn gulch, particularly the Bedford. It is an old property and work has been done on it at different times during the past 20 years. The principal value is lead with silver and gold. The vein is 50 ft. wide, averaging eight per cent lead, with a streak which varies from three to six feet in width that runs 50% lead, 29 oz. silver and a few dollars in gold. All the ore taken out came from the surface to a depth of 70 ft. A shaft is down 148 ft. but it will have to be sunk 148 ft. further before it will cut the vein. It is Mr. Redfern's intention to resume sinking this shaft.—O. F. Fenner, operating the Mapleton mine under lease, is about to make a shipment of ore to the Washoe smelter at Anaconda. The ore is low grade.

NEVADA.

ESMERALDA COUNTY.

It is reported that L. Effinger has sold the Silver Peak mines which have, for years, been the property of the John I. Blair estate. The purchasers are nearly all residents of Pennsylvania. The deal has been under way for over a year. The Silver Peak group consists of nineteen patented claims, situated eight miles from the town of Silver Peak. During their period of operation they produced $1,500,000, but have long been idle. The principal Eastern men in the syndicate are Wm. Flynn and George T. Ilver of Pittsburg.

The Nevada Copper Co. is reported to have bought the Blue Jay group of copper claims, four miles east of Yerington. The property has been mined to a depth of 450 ft. and has several thousand feet of workings. Sixty men will be placed at work and a drift will be run through the mountain at a depth of 500 ft. in order to permit shipments of ore from the east side to Mason station, six miles distant.

Up to the present there has been little sought except copper in the region about Sodaville. Recently, however, there have been some rich finds of lead-silver ore, which promise to become important. These discoveries were made 23 miles northeast of Sodaville. The best strikes are made about 12 miles from Goldike.

LINCOLN COUNTY.

B. S. Hermson, who with Joseph Dederichs is building a smelter at Good Springs, has secured ground containing deposits of zinc ore. It is said the deposits are extensive.

LYON COUNTY.

The new camp fourteen miles west of Yerington, has changed its name from Gold Pit to Buckskin. A mining district was organized in Buckskin last week and a recorder elected. The camp is making headway toward a town, but the late stormy weather and inability to get supplies has retarded matters. The townsite contains 200 lots 25 by 120 ft. with 80-ft. streets and 16-ft. alleys, and nearly all of these lots have been sold or bargained for.

NYE COUNTY.

Freiberg camp is 125 miles east of Tonopah and 70 miles east of Clifford. Several strikes have been made there recently, just west of the old mines that produced largely in early days. Prospectors are rushing in and there is considerable excitement in the district. The ledges are wide and carry copper, lead, silver and gold. Several of the old properties have been bonded. There is plenty of wood and water, and the camp can be developed by means of tunnels. A new district, to be called the Valley View, is to be organized. Shoshone creek, near Round mountain, is also attracting the attention of prospectors. Many strikes have been made there during the past few weeks and several groups of claims have been bonded. The new head-frame at the Montana-Tonopah is completed, and the compressor has arrived.

(Special Correspondence).—Development of the property of the Manhattan Mother Lode Mining Co. is being pushed. The tunnel is in 75 ft., and two veins have been encountered, both of good size; the first vein returned assays of $23.96, the second ran $30. It is expected that 50 ft. further will encounter the first of the three large veins which outcrop on the surface above the tunnel. As this vein pans free gold on the surface, it is supposed that in depth good ore will be obtained. The other claims of the Mother Lode Co. in the Timber Hill section are showing up well. Men are actively engaged in opening up the 30-ft. vein on the Great & Only claim, and already good assays have been obtained. It is believed that this company has a good-sized milling proposition. C. A. Humphrey, a pioneer of Manhattan, has been elected president of the Manhattan Express Mining Co., and will personally supervise the development of the company's property. Men have been put at work exploring the large lode that outcrops on the property, as well as a contact between porphyry and schist which can be traced through the company's holdings. William B. Root, a Colorado mining man, has been put in charge of the property. The lode has been opened up and a good grade of quartz, which pans free gold, has been uncovered. A shaft is being sunk.

The 200-ft. vein on the property of the Consolidated Manhattan Mining Co., at East Manhattan, is reported to be improving. The tunnel which is being driven for the Pine Bird claim of the Consolidated Manhattan, is in 30 ft., and the entire face of the tunnel is in ore. Samples gave returns of from $2.40 to $16. When the tunnel reaches a point under the apex of the hill, which will give a depth of 240 ft., it will be in the center of the vein which traverses the property for 3,000 ft. The tunnel will be continued through the hill, and driving will be commenced at different points. A contract has been let for the mill. This property is situated between the Buffalo Mining Co. and the Manhattan Mammoth Co., each of which has uncovered high-grade ore. A compressor plant has been ordered for the Mammoth Company.

At a depth of 80 ft. in the shaft of Gregory No. 2 of the Manhattan-Nevada Gold Mines, a drift was started last week into the lode which crops on the crest of the hill. The ore assays from $5 to $60 per ton in gold. Bids are now out for a contract to drive a tunnel from the base of the hill to open up all the veins that traverse the company's holdings.

A stringer of rich ore was encountered a day or so ago, just off the line of the property of the Manhattan Cowboy Mining Co., trending into the Cowboy ground. The large vein of sulphide ore which was struck in the shaft on the Cowboy a few days ago is improving with depth; the sinking of the shaft is being expedited so as to get down to 100 ft., when driving will be commenced. An assay of $17.30 was obtained from the pyrites. The surface rights of leases 4 and 5 of the Iron King claim of the Manhattan Cowboy Co. have been let and the lessees will install dry washers to work the placer deposits on these two blocks of ground.

Manhattan, April 30.

OREGON.

BAKER COUNTY.

(Special Correspondence).—Mining interest in eastern Oregon is focusing rapidly on the copper belt east of Baker City, where the North American, under management of D. W. C. Nelson, is developing an orebody that is daily becoming more important. The double compartment shaft has now attained a depth of 250 ft., and the last 85 ft. of it has intersected a deposit carrying native copper, similar to those of Michigan. The rock which is now coming out is literally red with fine particles of copper which constitute about five per cent. It carries also about $5 per ton in gold and silver. The rush into the copper belt is on in full force. The Corpe ranch, lying to the northwest of Burkemont, has just been bonded to A. E. Snell, and it is reasonably certain that diamond drills will be exploring this ground within a few weeks. This ranch lies on a direct line between the North American and the Indiana mine and has an outcrop of copper-bearing rock, similar to that on the surface of the two properties mentioned. At the Snake river end of the belt, some Pennsylvania capitalists, having finally settled the prolonged litigation over the Iron Dike mine, are now pushing the development of that property. As an incident in this connection, a railroad from Huntington down the Snake to Homestead, on which work has already been done, will now be pushed to completion. Another road from Baker City down Powder river, for which surveys have been made and right-of-way secured, will tap the copper belt, just below Burkemont, and parallel it to the Iron Dike mine at Homestead, where it will intersect the road from Huntington. These prospective facilities in transportation will form an important factor in the present inrush of operators. It is difficult to say which is the cause and which the effect, the assurance of a railroad into this region, or the work that is now proving the copper deposits.

In the gold-mining districts near Baker City there is unusual activity also. Heavy snows that fell in March are stored in the mountains and a long season is thereby insured to workers in the placer camps. The Raven placers, near the Gold Coin mine, have been leased to LaFayette Brown.—W. E. King has just completed a 10-stamp mill on his property in Rye valley which will go into commission at once.—Capt. Case has concluded a test, in Denver, of a carload of ore from the Tabor Fraction mine, above Sumpter, and the character of reduction plant, for that property, has been determined.—In Quartzburg district, the Standard, which produces cobalt, is putting in a concentrating mill, with a capacity 50 tons per day.—The Copperopolis, W. W. Gibbs, superintendent, is erecting a 150 ton concentrator.—Frank J. Davey, engineer-in-charge, is cyaniding 100 tons gold ore daily, from a surface deposit below the old Virtue mine.

Baker City, April 26.

JOSEPHINE COUNTY.

The Eureka mine, on Soldier creek, is reported sold to Pittsburg parties, the first cash payment being $30,000. Much tunnel work had been done, and $250,000 worth of ore has been blocked out. The mine was discovered ten years ago by William H. Miller who took out $15,000, which he mortared out.

SOUTH CAROLINA.

The Southern Kaolin & Aluminum Co. at Blaney, has been incorporated to operate a kaolin mining plant at Rolling's mill. The company will, for the present, confine its operations to mining and shipping kaolin and manufacturing caustic soda, expecting soon to equip a plant for the manufacture of aluminum. Officers of the company are E. O. DePass, president and treasurer; W. S. Leib of Philadelphia, secretary.

SOUTH DAKOTA.

CUSTER COUNTY.

The New York mica mine, at Four Mile, six miles west of Custer City, has been sold to F. N. Meyer, representing the Westinghouse Electric & Manufacturing Co., of Pittsburg. Work is to be resumed at the mine and a plant is to be erected, either there or in town, for trimming, grinding, and otherwise preparing the mica for market. This mine has the largest mica-bearing dike in the Black Hills.

The Gertie Tin Mining Co., at Hill City, has been running the mill for some time, and recently the company erected a small smelter to reduce the mineral. The first test has been made, resulting in a quantity of pig tin, and the company expects to continue smelting. The Gertie controls 155 acres of land near Hill City and development work has exposed a large amount of ore. The property is under the supervision of M. L. Moyer, of Cleveland. Tests are being made in Denver on ore from the Ivanhoe mine, six miles east of Custer. This ore has proved difficult to treat, but it is thought that the present investigation will result in a solution of the difficulty.

UTAH.

SALT LAKE COUNTY.

The Utah Copper Co. has placed an order for three mine locomotives, and also an order for 50 ore cars of 12-ton capacity. The equipment is to be used underground.

VIRGINIA.

The Rye Valley Lead Mines Co. has been reorganized for the purpose of continuing the operation of lead mines in Rye Valley, near Sugar Grove. It is the intention of the company, of which H. H. Green is manager, to install a 100-ton concentrating plant.

WASHINGTON.

FERRY COUNTY.

The Pearl Consolidated mine shows improvement in the Lone Pine workings, and if railway cars could be had ore shipments could reach 1000 tons this month. S. P. Domer, general manager of the Ben Hur mine, reports that ten to twelve carloads of ore have been the average monthly shipment for some time, and

the ore has shown a steady improvement, owing to the small rich streaks of silver sulphuret and iron sulphide with native gold which run through it. From ore shipped in April, more than all of the expenses were paid from three carloads, and from five carloads from the winze, now at the smelter, the returns are expected to run better than from any ore ever shipped from this mine. The winze from the 300-ft. level is down 50 ft. where the vein is five feet wide. The winze is ten feet from the shaft, and work on the latter will be resumed.

A shaft on the Hidden Wealth, in the Iron Mountain section of this district, was sunk fifteen feet on a 52-inch vein, with six inches of talc on foot and hanging. The ore is reported to assay $25 per ton, including 5.4% copper. Work will be resumed on the tunnel, which will be driven 50 ft. further to tap the vein 150 ft. deep.

OKANOGAN COUNTY.

A shaft has been started on the Copper World, on Palmer mountain, and the company will sink it to 500 ft. John Wentworth is superintendent.

Peter Berg, of San Jose, Cal., has brought suit in the Superior court, to quiet title, against the Lone Pine Group Gold-Silver Mining Co. He claims a part of the Lone Pine ground, and the mine has been closed to await decision of the court.

STEVENS COUNTY.

Shipment of ore from the Napoleon mine, east of Kettle river, has been suspended owing to the bridge at Orient being carried away by high water. There will be no effort to resume shipping until the aerial tramway has been installed. The ore shipments from the First Thought mine to the Granby smelter, at Grand Forks, B. C., have averaged 30 tons a day during the past month.

The contract for driving the last 100 ft. of a tunnel on the Orient group has been finished, and another will be let immediately.

BRITISH COLUMBIA.

YALE DISTRICT.

The four-compartment shaft at the Mother Lode mine is nearing the 400-ft. level. Drifting to connect with the winze from the north drift, which reached the 400-ft. level some time ago, will be commenced as soon as the shaft reaches the 400. The Mother Lode diamond-drill has been in operation on Primrose ground (to the south of the main shaft), where a hole 200 ft. deep has been bored, showing considerable ore. The last shipment of Strathmore ore maintained the past record of this mine, and strengthens the belief that it will become one of the paying mines of Greenwood. Returns show the first class went $151 per ton, and second class $82 per ton.

Surveys are being made and right of way secured for the extension of the new high-tension electric line from Greenwood to the Mother Lode mine of the British Columbia Copper Co. and the Boundary Falls smelter of the Dominion Copper Co., each being four miles from Greenwood. The work is being done by the British Columbia Constructing & Distributing Co., a subsidiary company of the West Kootenay Power & Light Co. At Greenwood and Grand Forks work is under way on the sub-stations for the company, where the power, which will be brought over the mountains from Bonnington falls on Kootenay river at 60,000 volts, will be transformed to about 2,000 volts for commercial purposes. The new sub-stations are to be replicas of those at Phoenix, which, finished and furnished, cost the company $40,000.

The Provincial road supervisor, E. E. Spragett, will leave the first of the week for the upper North Fork district to complete the building of six miles of wagon road to the McKinley mine and properties. The government recently set apart $3,750 for the building of this piece of wagon road, which will, when completed, give access to the principal properties of Franklin camp.

Work has been pushed on the excavations necessary for enlargement of the smelting works of the British Columbia Copper Co. at Greenwood. The old works will be practically rebuilt on modern plans, the machinery now being manufactured in the East, and some of it will be shipped soon. As a consequence of remodeling and enlarging the plant, it will be necessary to close the works for possibly two or three months, while the new machinery and buildings are being erected. In the meantime, shipments of ore will be discontinued at the company's Mother Lode mine in Deadwood camp, and the entire force placed on development, preparing for the larger output that will be required at the smelter when the enlargements are completed. The mine will, in the meantime, be equipped so that the machinery may be driven by electricity instead of with steam, as at present. When in running order again the smelter is expected to be able to treat about 50,000 tons of ore monthly, as against 18,000 tons, the present capacity. A strike has been made on the Gloucester property in Gloucester camp. T. Newby, with a force of miners, encountered a vein of high-grade chalcopyrite seven feet wide and traceable for over 250 ft. G. A. McLeod is at the mine, with Louis Noble of Denver. A. D. McPhee, superintendent of the McKinley mine, has gone from Phoenix to that property. Eight men are working at the McKinley and this force will be increased as soon as the roads permit hauling of mining machinery.

The Tyee Copper Co.'s smelter at Duncan's station, Vancouver Island, ran 13 days during April, and treated 1717 tons of Tyee ore, giving a return after deduction of freight and refining charges of $34,723.

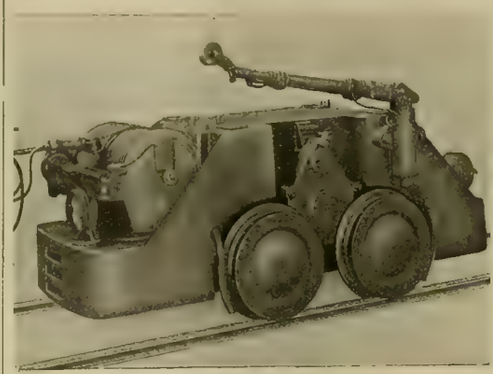
MEXICO.

DURANGO.

A consolidation of the Vacas Mining & Milling Co. with the Quebradilla Mining Co., has been effected, the properties of both concerns passing into the hands of a new company, the Vacas Mining Co. The Vacas mine has a large new Lidgerwood hoist and two boilers installed; the old concentrator was overhauled and many additions made to the machinery, all of which was in operation at the time of the transfer. The addition of other mines, giving larger ore resources, requires further increase of the mill capacity, already under way. Other enterprises in the vicinity are active, being encouraged by the expected extension of the railroad from Durango to Sombrerete, among which are the silver mines at La Novia, for the operation of which there is talk of a large electric power-plant.

JALISCO.

Approximately $35,000 gold will be spent by the San Pablo Mining Co. in the development of the San Pablo mines in Etzatlan district, which were recently purchased from W. M. Mathews. The plans call for a main tunnel and crosscuts aggregating 1,100 m., estimated to cost $22,500. The installation of the compressor and drill-plant, which have been ordered, will cost $7,500. W. M. Mathews, former owner of the mines, shipped 363 tons of ore from the San Pedro vein which netted him $13,159. Some of the ore shipped ran eight and one-half kilograms silver and 455 grams gold per ton. It is estimated that the ore can be mined and milled at a cost of $6 per ton.



NEW GOODMAN "M S 2" GATHERING LOCOMOTIVE.

Robert Scott, of San Jose, Cal., inventor of the Scott fine-ore furnace, is building a furnace for T. W. Lawson, of Boston, who owns extensive deposits in the Mascota district. The development of the cinnabar deposits has been in progress during the last two years.

Machinery for a reduction plant at the mines of the Aztec Copper Smelting Co., in the Guachinango district, has been shipped from the United States. The machinery consists of a rock-breaker, two mills and six concentrating tables, the plant having a capacity of 80 tons daily. The development work now in progress consists of a tunnel to cut the veins of the Concha and Perla mines, the first at a depth of 115 ft., and the second at 407 ft. The tunnel is designed to go 1,000 ft., and it is now in 175 ft. A wagon road has been completed from Ameca to the mines, a distance of 25 miles. George J. Graham is general manager of the Aztec Copper Smelting Company.

A company is being organized in New York by American and European capitalists to operate the Cuale mines, in the municipality of Talpa de Allende. A ten-year concession has been granted to this company, and includes 20 old Spanish mines, which have all been good gold, silver, copper and lead producers. It is said that there are thousands of tons of ore on the dump that can be milled at profit. The nearest point for shipment is at Penas, a port on the bay of Banderas, 40 km. distant. There is plenty of good timber, fir, pine, and oak on the properties, and an abundance of water for power.

SONORA.

The Ronquillo Mining Co. is developing a tract of 72 pertenencias, 18 miles south of Cananea. In drifts at 100-ft. depth, there is said to be a good showing of copper ore. The mines are in the Manzanal range, where a number of properties are being opened. The company also owns a small tract known as Swansea, lying to the east of the Cananea Consolidated Copper Co.'s Cobre Grande mine and north of the American property, where developments are also to be inaugurated. Thirty-six Wilfley tables and 72 Frue vanners are being added to the concentrators of the Cananea plant, the capacity of which will thereby be increased 1,000 tons daily. The mills are now handling 2,400 tons daily. At the smelter, reverberatories of the Anaconda type are being put in, while larger hoisting plants are to be installed at several shafts. The production of the Greene Consolidated Copper Co. for the month of March was 5,100,000 lb., compared with 5,000,000 lb. in February, and 5,100,000 lb. in January. The output of April will exhibit an increase, as the new reverberatory furnaces were placed in operation the first of that month.

A Real Gathering Locomotive.

The common tendency heretofore in the development of electric mining locomotives for use in gathering service has been to adapt standard designs, principally by addition of a cable reel. Efforts in this direction have involved use of the standard two-motor type of locomotive, having heavy side frames and fitted with two independent motors carried on the axles. This type of locomotive cannot be built sufficiently compact to fulfill properly the usual requirements of gathering work. For narrow gauges, the frame must be outside the wheels. Furthermore, the over-all length is necessarily excessive, because of the consturction required for accommodation of two motors. Other matters, including length of wheel base, general over-all dimensions, flexibility for operation over poor tracks, etc., combine to render difficult, if not thoroughly impracticable, the satisfactory adaptation of a standard type of locomotive to the conditions of gathering service.

In taking up this problem, the Goodman Manufacturing Co. has treated it as properly a subject of special design, recognizing the peculiar character of the work as distinctly different from regular haulage service. The accompanying illustration shows the new Goodman M.S.2 gathering locomotive, the design of which was dictated by careful analysis of the conditions to be met. As a principal requirement there has been recognized the necessity that a really efficient gathering locomotive must be of such size and weight as will enable it to go wherever a mine-car can go, and with equal facility. This requirement has been kept in mind throughout the design. The cable reel, by means of which the locomotive is enabled to run into rooms and other parts of the mine where the trolley wires are not extended, is a separate piece of mechanism, operating independently of the locomotive gearing. This feature of separate operation for locomotive and reel is of great importance.

As regards the locomotive, it should be noted that the wheel-base is very short and that the wheels themselves are small. Only one motor is used and this is built in as a unit with the locomotive frame. The axles are fitted with springs so as to afford a flexible wheel-base which will enable the locomotive to follow a rough track even more easily than will the mine-car itself. By gearing of special design and arrangement the armature of this single motor, built into the frame, is in driving connection with both axles, yet without interesting with the flexibility of wheel-base. This design and arrangement of a single motor geared to both axles enables extreme compactness, as is especially desirable in the matter of over-all length or of distance from center of drawbar pin at either end. The value of this characteristic will be appreciated in consideration of the necessity that such a gathering locomotive shall haul a mine-car, with short hitch, around room-neck curves of small radius.

The height of the locomotive from rails to top of frame is 32½ in., and the over-all length is 7 ft. 9 in. All operating devices are placed conveniently within easy reach of the motorman. The brake is worthy of note, being very powerful and providing accurate and close control, inasmuch as the brake-band is applied to a high-speed surface and is operated by a lever-handle with ratchet-latch. This machine is no larger than the average mine car, yet is extremely strong and of very simple design. It marks an essential departure in that it recognizes the special character of gathering service.

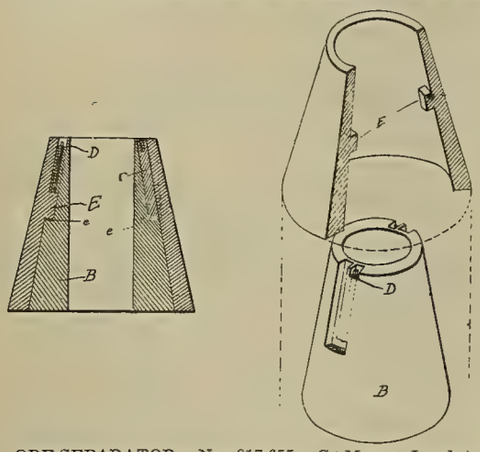
Mining and Metallurgical Patents.

Patents issued April 10, 1906.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

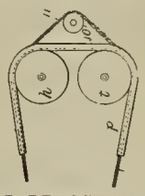
ROCK AND ORE BREAKING MACHINE. No. 817,672. E. H. Sansom, Goodwick, England.

A device of the character described comprising a cone having recesses in its face, a mantle fitting over said cone, lugs on the mantle adjustably fitting in the recesses of the cone, bolts passing through the cone and bearing against the lugs of the mantle to hold said mantle in its adjusted positions and locking-pins to hold the mantles, said locking-pins having recesses in their ends.



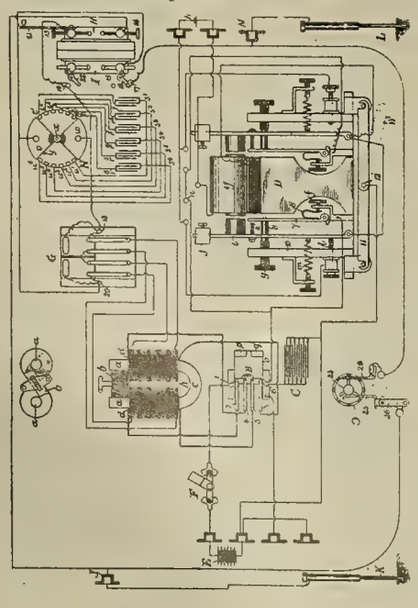
ORE-SEPARATOR. No. 817,655. G. Moore, London, England.

In an ore-separator, the combination of a traveling endless belt provided with side flanges, pulleys over which said belt runs, operating means for said belt, a second belt lying within said first-named belt and between the flanges thereof, said second belt being composed of two layers, the under layer being a wire screen and the upper layer being burlap, and an idler-pulley over which said second belt runs to separate it for an interval from said first-named belt.



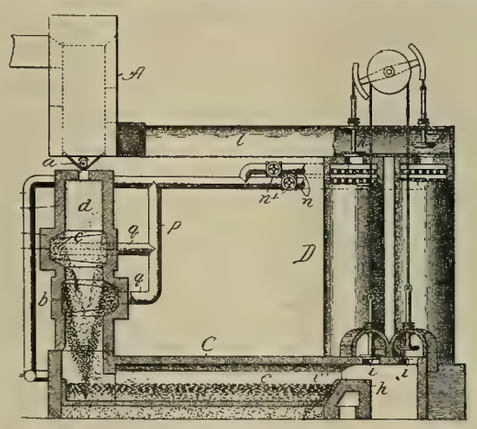
APPARATUS FOR DETECTING AND LOCALIZING MINERAL DEPOSITS. No. 817,736. L. Daft, Ealing and A. Williams, Wimbledon, England.

An apparatus for locating mineral deposits consisting of a combination of a source of electricity, an indicator which is adapted to emit fluctuating electric impulses, two portable electrodes which are electrically connected, having the battery and inductor in series between them, two other portable electrodes which are electrically connected and a resonator which is in series between them, such resonator being adapted to produce audible sensations from electric impulses.



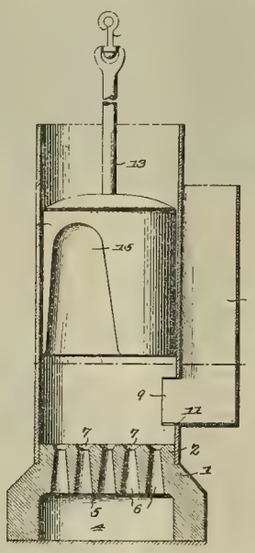
PROCESS OF REDUCING ORES. No. 817,414. H. F. Brown, Chicago, Ill.

The process of treating a finely-divided mixture of metallic oxides and slag-making impurities, which consists in subjecting the material while in atmospheric suspension to the action of a reducing-gas moving in the same direction, and during such subjection bringing the particles of the mixture into approximate physical contact, then causing the reduced material to pass without subjection to an oxidizing influence into a molten slag-covered bath, and at the same time causing the reducing-gas to mix over the surface of the bath with an excess of oxygen to further its combustion and heat the bath, then permitting separation by gravity of the metal from the slag-making impurities while protected by the said slag covering from the oxidizing atmosphere.



ROCK-CRUSHER. No. 817,298. J. Y. Byers and J. W. Myer, San Diego, Cal.

In a machine of the class described, the combination with a die provided with cone-shaped escape-openings having their upper ends countersunk, of a mortar having a feed-chute in its side, and a pestle arranged within the mortar and provided on one side with a pocket all the walls of which are curved.

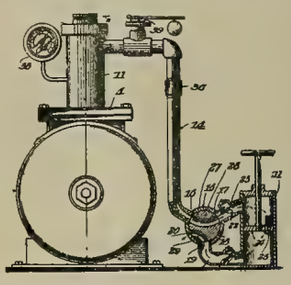


DRILL-ROD COUPLING. No. 817,398. V. G. Smith, Iola, Kans.

In a rod-coupling, a rod having at one end a recess tapered for the greater portion of its length and provided with an internal thread, said rod being further provided with a radially-disposed set-screw-receiving opening and having at its periphery a recess surrounding the wall of the opening, the wall of said recess being provided with a plurality of notches, a second drill-rod section having a threaded stem tapered for the greater portion of its length and provided near its extreme inner end with an annular groove, a set-screw extending through the radial opening and entering said groove, the head of the set-screw having a diametrical opening, and a cotter-pin arranged in said diametrical opening and movable in the direction of its length to introduce one of its ends into locking engagement with any one of the notches, the pin when free from the notches having unrestricted revoluble movement to permit adjustment of the set-screw.

ELECTRIC FURNACE. No. 817,212. C. O. Wingren, Pasadena, Cal.

The combination of a metallic air-tight casing composed of a body portion and a removable cover secured thereto, said cover being provided with an upwardly-extending dome, a portion of the top of said dome being transparent; electrodes insulated from and secured to said body; resistance material in said casing between said electrodes; a crucible in said resistance material between said electrodes; a heat-insulating material within said casing and surrounding said electrodes and crucible except at and near the dome; a viewing-pipe extending from the crucible upwardly through the heat-insulating material and terminating near the dome; and air-exhaust mechanism connected to said dome whereby the air may be exhausted from the crucible.

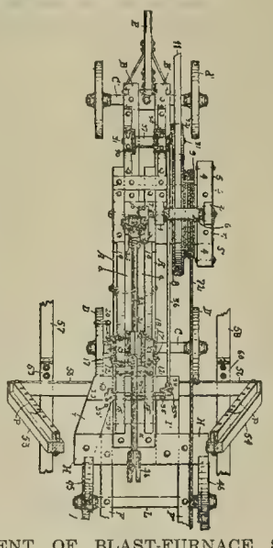


PROCESS OF TREATING ORES OF THE PRECIOUS METALS. No. 817,411. A. C. Atwater, Manchester, Iowa.

Process for extracting metals from their respective ores containing selenium, by volatilization, consisting in mixing the ores in granulated form with a theoretical proportion of carbonaceous material, say from one (1) to ten (10) per cent., according to the nature of the ore being treated, heating the materials so mixed while protected from the air, to a temperature sufficient to volatilize the selenium, which may be present and eliminating it in the form of vapor, thereby separating such element from the precious metals, after which allowing it to cool while the air is still excluded.

WELL-DRILLING MACHINE. No. 817,527. J. W. Shawver, Portland, Ind.

In a well-drilling machine having in combination, two main frame-sections, ground-wheels on which the said main frame-sections are mounted, an axle for each pair of ground-wheels, the forward section having a walking-beam mounted thereon, the frame of said front section being formed of a pair of main sills spaced apart and extending to the rear beyond rear wheels of said front section and forwardly terminating in the rear of the front wheels thereof, auxiliary sills extending from the sides of the main sills forward and being pivotally mounted to the axle of the front wheels, a derrick extending over and above the sections, means for securing the derrick in position, and means for raising and lowering the derrick by power transmitted through the mechanisms located on the machine.



TREATMENT OF BLAST-FURNACE SLAG FOR PRODUCTION OF MATERIAL SIMILAR TO TRASS, ETC. No. 817,158. H. Colloseus, Berlin, Germany.

The process of manufacturing trass-like material from blast-furnace slag, which consists in introducing into the stream of molten liquid slag small amounts of chemically-inactive liquid successively in quantities sufficient for immediate evaporation of the liquid in contact with the hot molten material.

Personal.

H. Kilburn Scott writes from Cape Town.

Frank Nicholls is on his way from London to Siam.

F. H. Minard has returned to Denver, from Mexico.

Fred G. Farish is examining mines near Hailey, Idaho.

W. A. Prichard now makes headquarters in Mexico City.

Alfred James is on his way from Australia to San Francisco.

R. Gilman Brown is making a visit of inspection at Ymir, B. C.

Alan J. Fairbairn has returned to Breckenridge, Colo. from London.

George E. Moulthrop is general superintendent for the Red Metal Co., at Butte.

F. M. Simonds and E. Z. Burns, of New York, are in Mexico on professional business.

Arthur C. Carson has been appointed general manager of the Butte Coalition Co., at Butte.

J. V. N. Dorr, of the Black Hills, has returned from a visit to Salt Lake City and Denver.

M. C. Russell, of Lake City, Minn., is at Half Moon Pass, Sunny Mt., Fergus county, Montana.

Wilbur E. Sanders, of Helena, Mont., is investigating mines in Washington and British Columbia.

Rensselaer H. Toll, of Mancos, Colo., is in Cripple Creek this week examining mining property.

Wilbur E. Sanders, of Helena, Mont., is investigating mines in Washington and British Columbia.

Lewis T. Wright, manager of the Mountain Copper Co., has returned from a hurried visit to New York.

E. M. Ray, manager of large mining properties in Chihuahua, Mexico, is in Denver, Colo., for a few days.

John B. Farish, who was in San Francisco during the earthquake-fire, is on his way from Denver to New York

H. G. Murray leaves San Francisco on May 25 for Java, to take charge of mining operations for an English company.

W. W. Barton, manager of the Gt. Boulder Main Reef mine in Western Australia, has resigned and is expected in Mexico.

H. DeC. Richards, whose address is still at the Cosmos Club, San Francisco, has gone to New York on a brief visit.

Edgar Collins, manager of the Combination Mines, Ltd., at Goldfield, Nevada, has been on a visit to Santa Cruz, California.

Reginald W. Petre, of Baltimore, has been appointed manager of the Colonial Copper Co.'s mines at Cape D'Or, Cumberland county, Nova Scotia.

Edward H. Nutter passed through Berkeley on his way to Telluride, Colo., where he will be assistant superintendent of the Liberty Bell mine.

Guy Sharwood, a student of the University of California, has gone to the Homestake mine, at Lead, South Dakota, to join his brother, W. J. Sharwood.

E. H. Nutter has resigned the superintendency of the Standard Consolidated mine at Bodie, Cal., and has gone to the Liberty Bell mine near Telluride, Colorado.

Donald R. Morgan has resigned as superintendent of the mining department of Cia. Metalurgica de Torreon, S. P., and will assume the duties of consulting engineer with the same company.

F. H. Mason, who until lately carried on a consulting mining and metallurgical business at Halifax, Nova Scotia, has sold the goodwill of the same to A. L. McCallum, late of the Dominion Steel Co. Mr. Mason proposes to reside in California in future. He is now at Johnsville, Plumas county, California.

Books Received.

High-Tension Power Transmission, Vol. II, is a series of papers and discussions presented at the International Electrical Congress in St. Louis, and presents in convenient form the present state of knowledge of the transmission of power by electricity. Much space is devoted to the various types of line construction, particularly as to details. Each of the several papers has been written by men who are in daily contact with the actual business of designing, constructing, and operating electric transmission plants. As a book of reference it is superior, and one which will well repay careful study. This book will be sent upon application to the Mining and Scientific Press. Price $2.50. Published by the McGraw Publishing Company, 114 Liberty St., New York.

Electric Transmission of Water Power, is a late contribution to this important subject, by Alton D. Adams. The work systematically takes up the various problems connected with the transmission of electrical energy, developed by water power, including the location and development of water powers, the limitations of electrical transmission, advantages of alternating and continuous current, locations of power stations, line equipment, materials, and construction details. The work is handsomely and profusely illustrated, including several maps showing important electric installations. To electrical engineers and students this will be a valuable book, both for study and reference. Sent by the Mining and Scientific Press upon receipt of price, $3. McGraw Publishing Company, 114 Liberty St., New York.

Notes on Electrochemistry, by F. G. Wiechmann, has the distinction of being something new in this line. It has been the aim of the author to meet the requirements of the student of the interesting science of electrochemistry, the chief object being the supplying of suitable notes to students entering on the study of the subject, saving much laborious research in larger volumes. While this book contains much found in other and larger volumes, it has systematically arranged the matter so as to make it a convenient introduction to the study of electrochemistry. Sent by the Mining and Scientific Press upon the receipt of price, $2. McGraw Publishing Company, 114 Liberty St., New York.

Temporary Addresses of San Francisco Firms and Professional Men.

ADAMS, W. J., 2205 Bush St., San Francisco.

ALLIS-CHALMERS CO., 906 Broadway, Oakland.

AMERICAN TOOL WORKS, 4153 20th St., San Francisco.

ASBESTOS MFG. & SUPPLY CO., 1834 Ashby Ave., Berkeley.

BAKER & HAMILTON, 113 Berry St., San Francisco.

BALFOUR, GUTHRIE CO., 714 Broadway, Oakland.

BARNHART & SWASEY, 878 Broadway, Oakland.

BOESCH LAMP CO., 1569 Grove St., San Francisco.

BOSQUI, F. L., Ross, California.

F. W. BRAUN & CO., 2513 24th St., San Francisco.

BROWN, R. GILMAN, Sturgis Warehouse, 2031 Sutter St., San Francisco.

BROWNELL, J. S., 29 Jordan Ave., San Francisco.

BURCH, A., Cosmos Club, San Francisco.

BUTTERS, CHAS., 4 Bacon Block, Oakland.

BYRON JACKSON MACH. WORKS, 18 Telegraph Ave., Oakland.

CALIFORNIA PERF. SCREEN CO., 1300 Arch St., Berkeley.

CALIFORNIA HYD. ENG. & SUPPLY CO., 1169 Jefferson St., Oakland.

CALIFORNIA ORE TESTING WORKS, 364 Bay St., San Francisco.

CHROME STEEL WORKS, 1736 Walnut St., Berkeley.

COMPRESSED AIR MACH. CO., 415 Fillmore St., San Francisco.

DENNISTON'S S. F. PLATING WORKS, 3454 21st St., San Francisco.

DEWEY, STRONG & CO., 10 Bacon Block, Oakland.

GEO. E. DOW PUMPING ENGINE CO., 3116 Washington St., San Francisco.

ELECTRIC BLUE PRINT CO., 70 Macdonough Bldg., Oakland.

EVANS, GEORGE H., Regent St., Fairview Park, Oakland.

FAIRBANKS, MORSE & CO., 969 Broadway, Oakland.

FALKENAU ASSAYING CO., Polytechnic Business College, Cor. 12th and Harrison, Oakland.

FORBES, JOHN F., 601 Kohl Bdg., San Francisco.

W. P. FULLER & CO., 412 12th St., San Francisco.

FULTON IRON WORKS, Harbor View, San Francisco.

W. T. GARRATT & CO., 2398 Broadway, San Francisco.

GUTTA PERCHA & RUBBER MFG. CO., 402 High St., Alameda.

JOSHUA HENDY MACHINE WORKS, Bay and Kearny Sts., San Francisco.

HARRON, RICKARD & McCONE, 2nd and Clay Sts., Oakland; 7th and Berry Sts., San Francisco.

HARMON LUMBER CO., S. H., 1st and Brannan Sts., San Francisco; 1921 Fillmore St., San Francisco.

HEALD'S BUSINESS COLLEGE, 1451 Franklin St., San Francisco.

HENSHAW, BULKLEY & CO., 1010½ Washington St., Oakland.

J. C. HOWLETT MACHINE WORKS, 1014 Buena Vista Ave., Alameda.

HOFFMAN, ROSS B., 566 31st St., Oakland.

HOLMES, GEO. L., 143 Santa Clara Ave., Oakland.

HUNT, BERTRAM, H. F. Eckert, 750 59th St., Oakland.

JANIN, STEBBINS & SMITH, McDonald Bdg., Oakland.

KROGH MFG. CO., 2506 Sutter St., San Francisco.

A. LIETZ & CO., 918 Broadway, Oakland.

LUCKHARDT, C. A., 723 Paru St., Alameda.

McMASTER, D. J., 512 Folsom St., San Francisco.

MEESE & GOTFRIED CO., 1332 McAllister St., San Francisco.

A. MERLE & CO., Bay and Stockton Sts., San Francisco.

MOORE & SCOTT IRON WORKS, 412 Main St., San Francisco.

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R. N. NASON & CO., 15th and Utah Sts., San Francisco.

NATIONAL WOOD PIPE CO., 518 11th St., Oakland.

NOYES, W. S., Room 25, Albany Block, Oakland.

NEVADA METALLURGICAL WORKS, 723 Paru St., Alameda.

OCCIDENTAL MACHINERY & ENG. CO., 2303 Pacific Ave., San Francisco.

PACIFIC TANK CO., 518 11th St., Oakland.

PARAFFINE PAINT CO., 405 Mutual Savings Bank, Oakland.

PELTON WATER WHEEL CO., 1259 Alice St., Oakland.

GEO. W. PENNINGTON SONS, INC., 934 Shotwell St., San Francisco.

PLATT IRON WORKS CO., Agency, 100 Bacon Block, Oakland.

GEO. W. PRICE PUMP CO., 105 8th St., Oakland.

RAPID-ECONOMY STAMP MILL CO., 2537 Hilgard Ave., Berkeley.

REDWOOD MANUFACTURERS' CO., 564 9th St., Oakland.

RISDON IRON WORKS, 270 Steuart St., San Francisco.

RIX COMPRESSED AIR & DRILL CO., 1222 Franklin St., Oakland.

JOHN A. ROEBLING'S SONS CO., 1116 Broadway, Oakland.

SAN FRANCISCO BRIDGE CO., Ft. of Walnut St., Oakland.

SIMONDS & KING, 1605 Walnut St., Alameda.

SMITH, EMERY & CO., 1104 Broadway, Oakland.

SMITH & CO., FRANCIS, 8th and Townsend Sts., San Francisco.

UNITED IRON WORKS, 2nd St., Oakland.

UNION GAS ENGINE CO., 23rd Ave., Alameda.

VULCAN IRON WORKS, 1259 McAllister St., San Francisco.

VAN DER NAILLEN, A., 5182 Telegraph Ave., Oakland.

WESTERN MACHINERY CO., 230 Main St., San Francisco.

WESTERN FUEL CO., 340 Steuart St., San Francisco.

WESTINGHOUSE ELECTRIC & MFG. CO., 1115 Broadway, Oakland.

H. S. WHITE MACHINERY CO., 9th and Bryant Sts., San Francisco.

GEO. E. WOODBURY, 1360 Webster St., San Francisco.

WESTERN GAS ENGINE CO., 547 Fulton St., San Francisco; cor. 3rd and Washington Sts., Oakland.

Trade Treatises.

The Crocker-Wheeler Co. announce Bulletin 64, which describes Form 1, Motors and Generators.

The Colorado Iron Works Co. of Denver, Colo., has issued an interesting pamphlet, Catalogue No. 9A, descriptive of their Impact Screen, which is designed to screen ores either wet or dry.

The Wellman-Seaver-Morgan Co. of Cleveland, Ohio, have issued a handsome circular, descriptive of their electric hoists, in which the several types of electric winding engines made by them are fully described and illustrated.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 10 Bacon Block, Oakland, has official reports of the following United States patents issued to Pacific Coast inventors:

819,196—SLEEPING CAR—T. O. Abbott, Seattle, Wash.
819,114.—SAW SET—G. Y. Anderson, Seattle, Wash.
819,629.—REGULATOR FOR WATER WHEELS—G. H. Bailey, San Francisco, Calif.
819,686.—SAFETY DEVICE FOR FOLDING BEDS—S. B. Bankson, San Francisco, Calif.
819,204.—CHICKEN ROOST—G. H. Buckingham, Los Angeles, Cal.
819,700.—FURNACE—A. C. Calkins, Los Angeles, Cal.
819,636.—SUBMARINE DRAG-BUCKET—E. J. Condlon Ballard, Wash.
819,691.—DUMPING VESSEL—P. Constantine, Seattle. Wash.
819,042.—UNDERREAMER FOR MINERAL BORING—A. Cummings, Los Angeles, Cal.
819,342.—SOLAR WATER HEATER—M. T. Cunniff, Riverside, Cal.
819,211.—VAPOR GENERATOR—R. F. Driscoll, San Francisco, Cal.
819,529.—VULCANIZED MATERIAL—F. Ephraim, San Francisco, Cal.
819,540.—PROPELLER—F. C. Gordon, Asotin, Wash.
819,698.—SEAM-IRONING MACHINE—Hall & Martin, Oakland, Cal.
819,217.—OIL CAN—C. R. Harless, Dayton, Wash.
819,426.—HEALER & DUPLEX BURNER—C. R. Harris, Los Angeles, Cal.
819,277.—BRAKING APPARATUS—W. L. Holman, San Francisco, Cal.
819,282.—MEANS FOR PROTECTING PILES—A. M. Hunt, Berkeley, Cal.
819,660.—GAS WASHER—L. P. Lowe, San Francisco.
819,661.—MANUFACTURING GAS—L. P. Lowe, San Francisco, Cal.
819,662.—GAS-MAKING APPARATUS—L. P. Lowe, San Francisco, Cal.
819,663.—COKING & MAKING GAS—L. P. Lowe, San Francisco, Cal.
819,664.—APPARATUS FOR SEPARATING RESIDUE FROM LIQUIDS—L. P. Lowe, San Francisco, Cal.
819,665.—GAS HOLDER—L. P. Lowe, San Francisco, Cal.
819,666.—APPARATUS FOR GENERATING GAS—L. P. LOWE, San Francisco, Cal.
819,295.—PUMP MECHANISM—S. W. Luitwieler, Los Angeles, Cal.
819,239.—MIXING & COMBINING DEVICE FOR GAS ENGINE—L. J. Marks, San Francisco, Cal.
819,576.—SLING FOR HOISTING APPARATUS—W. L. McCabe, Seattle, Wash.
819,074.—GAS GENERATING MACHINE—O. V. Monroe, Portland, Ore.
819,575.—BAKING APPARATUS—G. A. Muller, San Francisco, Cal.
819,306.—BALLOT MEMBER FOR VOTE REGISTERING MACHINES—D. L. Newcomb, San Diego, Cal.
819,583.—AUTO. DOOR OPENER & CLOSER—K. Nishimoto, San Francisco, Cal.
819,379.—CANDLE LAMP—W. J. Rogers, San Jose, Ca'
819,463.—DRAFT-EQUALIZER—H. C. Scott, Ritzville, Wash.
819,317.—SUBMARINE OBSERVATION TOWER—J. E Shrewsbury, Longbeach, Cal.
819,677.—ELECTRIC BLOCK SIGNAL SYSTEM—P. J Simmon, Chico, Cal.
819,384.—APPARATUS FOR TRUING GRINDING DISKS—G. A. Stansbury, Los Angeles, Cal.
819,182.—FRICTION GRAINING MACHINE—Taylor & Flint, San Francisco, Cal.
819,386—SHOCK ABSORBER—H. C. Turner, Los Angeles, Cal.
819,387.—PNEUMATIC TIRE—C. R. Twichell, Los Angeles, Cal.
819,621.—PAVER PUNCH & SHEARS—L. Van Dorin San Bernardino, Cal.
819,679.—AUTO. COMPUTING CHEESE CUTTER—F. F. Wear, San Francisco, Cal.
819,394.—ADVERTISING DEVICE—H. S. Williams, Los Angeles, Cal.
819,328.—PIANO ACTION—J. L. Wilson, Los Angeles Cal.
819,490.—NONREFILLABLE BOTTLE—E. K. Wood, San Francisco, Cal.
819,195.—ELECTRIC ELEVATOR—P. Wright, Los Angeles, Cal.
819,112.—DISH CLEANING APPARATUS—R. Wylie Napa, Cal.
37,980.—(DESIGN) SCRAPER—E. R. Deming, Alameda, Cal.

Commercial Paragraphs.

The C. A. Luckhardt Co., of The Nevada Metallurgical Works, are prepared to resume their usual business at 810 Broadway, Oakland, California.

The Westinghouse Electric & Mfg. Co., within the last week or two, have received orders for 55 electric locomotives, some of which are for mining work.

The Broderick & Bascom Rope Co., of St. Louis, have just published a comprehensive price list marked 'G' which is considerably larger than the last one published. This will be sent to anyone interested.

Fairbanks, Morse & Co., Chicago, report the sale of a large number of their standard mine cars to the Republic Iron & Steel Co., Nassau Ore Co., La Rue Mining Co. and the Rhodes Mining Co., for use in these companies' large iron mines in Minnesota.

The Western Gas Engine Co., Los Angeles, builders of engines and hoists, have opened branches in Oakland and San Francisco. J. F. Willard, formerly manager for Beck, Wakefield & Co., is in charge. They are located at Third and Washington streets, Oakland, and 547 Fulton St., San Francisco.

The De La Vergne Machine Co., New York, reports having recently closed the following contracts for Hornsby-Akroyd oil-engines: Windsor Locks Water Co., Conn., 50 h.p.; John McKesson, Chappaqua, N. Y., 9 h.p.; Bergstrom & Bass, Brooklyn, N. Y., 20 h.p.; S. Oppenheimer & Co., New York, 25 h.p.; Freeman, Daughaday & Co., Chartley, Mass., 50 h.p.; Township of West Lebanon, Pa., 44 h.p., for pumping station; Borst & Rockstroh, Middleburg, N. Y., 7 h.p.; The John Prikl Iron Works, Brooklyn, N. Y., 50 h.p.; John W. Sullivan, New York, 75 h.p.; F. A. C. Perrine, New York, 7 h.p; Houston Ice & Brewing Co, Houston, Tex., 16 h.p.

Wm. Clegg, Jr., who has been special agent of the Westinghouse Electric & Mfg. Co. in their St. Louis territory, has been appointed acting manager of the St. Louis office. D. E. Webster, formerly manager of the office, has been transferred to a position in the Chicago sales office of the company. J. S. Tritle has been appointed acting manager of the new district office opened by the company in room 512, New England building, Kansas City, Mo.

Latest Market Reports.

Anglo-American Shares.

Cabled from London.

	May 10	May 17.
	£ s d	£ s d
Camp Bird	1 2 3	1 2 10½
El Oro	1 5 6	1 6 9
Esperanza	3 16 6	3 15 0
Dolores	1 18 9	1 18 9
Oroville Dredging	0 17 6	0 17 0
Stratton's Independence	0 7 0	0 7 0
Tomboy	1 6 9	1 6 3

(By courtesy of W. P. Bonbright & Co., New York.)

METAL PRICES

By wire from New York.

Average prices week ending:	May 10.	May 17.
Lake	$18.62@$18.75	$18.62@$18.80
Electrolytic	$18.25@$18.50	$18.30@$18.55
Casting	$18.00@$18.25	$18.12@$18.25
Lead	$ 5.60	$ 5.70
Spelter	$ 6.00@$ 6.06	$ 6.00
Silver	$ 0.67	$ 0.66⅝

7-USEFUL BOOKS-7

BY T. A. RICKARD

EDITOR OF THE MINING AND SCIENTIFIC PRESS

THE STAMP-MILLING OF GOLD ORES.....$2.50
A general treatise on the practice of the stamp-mill in America, Australia and New Zealand.

THE COPPER MINES OF LAKE SUPERIOR.....$1.00
An attractive book describing the famous mines of the Keweenaw peninsula, with observations on the methods employed in the mills and underground.

ACROSS THE SAN JUAN MOUNTAINS.....$1.00
An account of a 400-mile ride across the most interesting mining regions of Colorado.

THE SAMPLING AND ESTIMATION OF ORE IN A MINE..$2.00
This describes an important branch of mining engineering, and is based upon many years of actual practice in the examination of mines. The value of the book is enhanced by a discussion to which many distinguished engineesrs contributed.

PYRITE SMELTING. Edited by T. A. Rickard.....$2.00
Discussion and comment on the treatment of sulphide ores in the blast furnace without carbonaceous fuel, with contributions by the leading metallurgists of America.

ORE DEPOSITS—A DISCUSSION. Edited by T. A. Rickard $1.00
With contributions by S. F. Emmons, W. H. Weed, J. E. Spurr, W. Lindgren, J. F. Kemp, F. L. Ransome, C. R. Van Hise, and C. W. Purington.

ECONOMICS OF MINING. Edited by T. A. Rickard.....$2.00
Discussion and comments by experienced mining engineers. The book deals with mine valuation, costs, ratio of equipment to ore reserves, and other allied subjects.

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MINING AND SCIENTIFIC PRESS.

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EDITORIAL.

MILLMEN and metallurgists will thank Mr. Charles Butters for his practical notes on the operation of tube-mills at El Oro. The practice is so new that the literature of the subject is scant, and it is not often that so busy a man can be persuaded to take his pen in hand. Our friends at El Oro will receive Mr Butters' suggestions with interest, and we trust that they may be able to add to the information which we take pleasure in publishing. We are informed by Mr. Charles Rhodes, manager of the Waihi mine, that the service given by the tubes has proved so satisfactory, that shortly there will be a dozen of them at work at this, the premier gold mine of Australasia.

OUR CORRESPONDENT at Toronto has had much that is interesting to say recently concerning the Cobalt mining excitement in northeastern Ontario, Canada. We note that one mining company, the Nipissing, has issued its annual report, according to which the net profits to May 1 have been $1,021,628, giving $400,000 to the shareholders and leaving a surplus of over $600,000. The ore all came from near the surface, the deepest shaft at Cobalt having reached only 230 feet. The ores are valuable chiefly for native silver, together with nickel and cobalt minerals. In many ways, in its mineralogy and ore occurrence, Cobalt resembles the mines of the Chalanches, near Allemont, in southeastern France.

ON ANOTHER PAGE we publish part of an address delivered by Mr. John C. Branner of Stanford University. Professor Branner needs no introduction to our readers. The address we refer to was intended as a popular explanation of certain scientific observations, and we confess that when a first-rate man of science takes off his coat—of conventional phraseology and rather overburdened terminology—in order to explain things to the lay mind, although in common with our readers possessing the rudiments of a scientific training, we enjoy it. Huxley's addresses to workingmen still stand as the ideal of scientific lectures. They were listened to with equal interest and profit by Prime Ministers and carpenters. This is a time when geologists are not without honor in their own precinct; we hope they will utilize the opportunity to enlighten the popular mind on matters that recent events have proved to possess a vital interest.

THE ANNUAL REPORT of the Anaconda Copper Mining Company, given elsewhere in this issue, is interesting. It appears that, finding it impracticable to modernize the old reduction works, the new smelter of the Washoe Copper Company (of the Amalgamated) was leased, and thereby a saving of $2,583,549 was effected on the treatment of 1,626,306 tons of ore and slag, equivalent to $1.5886 per ton, as compared to the old works. The report speaks of "modernizing" the old plant, and the use of the word is suggestive. When you modernize a copper plant, you adopt the improvements introduced not during the past century, but in the last ten or fifteen years. At the mines, the explorations at the bottom have been most encouraging, rich ore being found at 2,400 feet. This means much to Butte and signifies a good deal to the geologist, for it has proved that secondary enrichment, by deposition of chalcocite, can, under rare conditions, extend to a great depth. The profits for the year represent 19.06 per cent on the $30,000,000 capital of the company. By reason of the increase in the price of copper, which is 2½ cents higher than the average of 1905, the Aanaconda Copper Company should make a handsome showing during 1906. Whatever it may be, it is likely to be discounted far in advance by the stock market.

THE DIFFICULTY of classifying tracts of land claimed by railroads to be agricultural, and, therefore, within the terms of their grants, has been lessened lately by co-operation between the General Land office and the Geological Survey, whereby experts from the latter department have given their opinions conclusively on the question in dispute. As a rule the testimony in such cases is of the most obviously worthless kind, being rarely free from influence, but this utilization of the special knowledge of a scientific bureau will secure the evidence of witnesses who are not advocates. A case in point occurred recently when the Government took steps to investigate the real character of a tract covering thirty townships in Idaho which had been claimed by the Northern Pacific Railroad to consist of agricultural land. In rebuttal of the railroad company's case, the Secretary of the Interior caused an examination to be made by one of the geologists of the Survey, and his testimony, supporting the classification of the tract as mineral land, won the case. We believe that the officers of the Survey would testify against the Government interest should the geological data indicate the non-mineral character of a disputed tract, in short, that they give the facts as they find them—the only sort of testimony compatible with the spirit that actuates scientific enquiry. The railroad companies are entitled to their legal rights, and if we welcome a decision adverse to them, it is only because there is good reason to believe that, in many instances, they have stretched the meaning of the terms whereby they were granted certain privileges until their grants have served as the instruments of land grabbing, prejudicial to the rights of the community.

Earthquake Sounds.

There is no question as to the fact that earthquakes are audible before they are felt. We noted this on April 18, not in case of the big shock, when our faculties were otherwise engaged, but in connection with several later movements on the same day. Other trustworthy evidence has been secured since. An intelligent lady who had experienced the earthquake of 1868, being awake, at 5 A. M. on April 18, 1906, heard the sound of the oncoming disturbance; it seemed to her like the sound of a mighty rushing wind and knowing what it presaged, she instantly alarmed the inmates of the house. As they escaped outdoors, the tremor came; it shook the earth so that they found it hard to stand and in the meadows close-by the live oaks swung from side to side so as to touch the ground. In the City, several men who happened to be out-doors early on that morning, found it impossible to keep their feet, while a ripple of movement—a sardonic smile—passed over the face of the earth. Others have testified to the noise preceding the arrival of the shock; it varied in intensity according to the distance from the line of actual fracture. This traversed, among other localities, the canyon of Los Gatos, in the Santa Cruz mountains. A trustworthy witness living there, informs us that there was a rumble and a roar like cannonading and that it was "deafening." We also have professional testimony. Mr. John B. Farish, a mining engineer known to our readers, offers valuable evidence on this point. He says: "On the eventful Wednesday morning I was awakened by a loud rumbling noise which might be compared to the mixed sounds of a strong wind rushing through a forest and the breaking of waves against a cliff. In less time than it takes to tell, a concussion, similar to that

caused by the near-by explosion of a huge blast, shook the building (the St. Francis hotel) to its foundations and then began a series of the liveliest motions imaginable, accompanied by a creaking, grinding, rasping sound, followed by tremendous crashes as the cornices of adjoining buildings and chimneys tottered to the ground." The first of these seismic sounds are referable to the rupture of the rock and the subsequent shifting of the broken parts. Sound travels faster in rock than in air. In air the speed is only 1,100 feet per second. It is stated that the earthquake of April 18 was felt at Tokio 11 minutes later than at San Francisco, but this does not mean much until further data indicate at what point the shock originated. It may have been under the Pacific ocean, and in that case the local movement along the old fault-plane in the Santa Cruz mountains would be accessory to a bigger fact. According to good authority, the small earth-waves that make the sounds, travel faster than the big vibrations that cause the shock, the difference in speed being due to the fact that they pass through an imperfectly coherent medium. From the sifting of plentiful data, it was ascertained that the Charleston quake had a velocity of 5,184 meters per second, or 190 miles per minute. The average velocity of the big shocks was 120 miles, while that of the tremors was 180 miles per minute. On the other hand the velocity of sound in granite is 15,000 to 18,000 feet per second, or 170 to 200 miles per minute. This seems to explain why the rumble and roar of a big earthquake precede the shock.

Coal Strikes.

The threatened strike in the Western bituminous coalfields affords food for thought, quite apart from the immediate results of the quarrel between operators and miners.. A thoroughly well informed correspondent at Chicago deals with the subject, under Special Correspondence. in a manner which is well worthy of careful perusal by anyone who desires to see just dealing between employer and employee. In default of a benevolent despot sufficiently powerful and adequately intelligent to discipline the predatory elements of our community, there is nothing except the creation of a strong public opinion to compel justice and fair treatment. One cannot read the description of conditions as given by our correspondent, without realizing how utterly unprincipled are the tactics of both sides, the miners relying on the strength of their organization rather than any right in their cause and therefore breaking contracts in the most callous manner; while the operators appear to be intent on using this opportunity to disregard agreements they themselves had made with the men. and others enacted by the State legislature. Meanwhile, in the anthracite region of Pennsylvania, a dangerous and costly strike has been avoided by concessions made on the part of the mine workers, it being agreed that the awards of the Anthracite Strike Commission of 1903 shall be renewed for three years longer. The retreat of John Mitchell and the other leaders of the United Mine Workers is to their credit, in that their action prevented a great evil to the country and whatever the reasons for it, we accept the fact. There is no doubt but that public opinion was mainly on the side of the operators, whose talk of an 'open shop' deceived many—the anthracite operators constituting the closest monopoly in existence, save Standard Oil. During the two months consumed by the negotiations, the coal companies were able to sell a large part of their stocks of coal at an inflated price. However, the community is to be congratulated on the postponement of further cat-and-dog fights between miners and operators, for three years—long enough to tide over the next presidential election. In the meantime we trust that the Federal authorities will expose the identity of the coal-operators combination and the coal-carrying railroads, so as to stop such predatory industrialism; and though it be too much to hope, we trust the workmen will learn that so long as their demands are just, they can expect the support of public opinion, and that without it they must be powerless, if that which we call civilization is to exist. As for ourselves, we have no more sympathy with the lawless few than the lawless many.

Handling Men.

The subject of the proper manner of managing miners has been discussed recently in this journal by two contributors, both of whom are well-qualified to express opinions. As between the tyrannical foreman who drives his men by sheer power of nerve force, occasionally supplemented by an exhibition of muscular superiority, and the easy-going boss who tries to make things pleasant all round, there is an obvious need of a compromise. Mr. Edward W. Ralph has emphasized the fact that the right man represents the mean between a 'bull-dozer' and the 'good fellow.' It is a problem of practical moment; many a mine has suffered through stupidity in this regard, for men are more than machines, and to get the best service out of them they must be treated neither as coolies nor as mandarins. To our mind the best kind of Cornish foreman represents a desirable type; he is a miner himself, a miner from the ground up, he can do the things he expects others to do, he is physically able to take care of himself in a scuffle, he is good natured and possesses that saving salt, a sense of humor. Many an awkward fellow can be won by a bit of fun at the proper season, especially when backed by other more solid qualities, and good nature will enable a man to shed vituperation which otherwise might lead to a fight. Old Capt. Martin Goldsworthy, in the Michigan copper country, was of this kind. One day when a big Swede had called him all the names not in the dictionary and had finally retired, someone asked the Captain, who was a big powerful man, why he had not knocked him down; he replied, with a smile and a shrug: "Oh, that's one of the honors of my position." In other words, there was no call for him as a boss to step down and engage in a bout with one of his men, unless actually struck first. It is amusing. and instructive too, to see how a Cornishman will handle a polyglot crowd of men whose languages he does not understand and yet be able to instruct them as to their duties. But our friend from the 'old county' has one fault, he is apt to stand in with his men, especially if they are his countrymen. A foreman who does not regard himself as identified with the interests of his employer is dear at any price, and is a sure source of eventual disorganization. It is possible for one who has men under his charge to be fair alike to them and to the owners of the mine; in fact, a foreman is really set to see that the implied contract, of honest work for reasonable pay, is carried out. Such a man can be kind without being easy, and energetic without appearing officious. It amounts to this, that the qualities that make a man capable of handling men underground are those that make a good general manager, and though the latter needs a different kind of education, the education itself is of little use unless it is allied to the comprehending insight that enables a man to direct his fellows.

By the Way.

At the recent meeting of the National Association of Manufacturers, the president, Mr. David M. Parry, said:

The industrial era has developed so rapidly, that it would have been surprising had society adjusted itself to the new conditions without friction and agitation. Only a few generations ago the employer had little capital and hired a few men, but industry brought with it its heavy capitalization and its millions of employees. While the accumulation of capital is essential to the general material welfare, yet the visual evidences of its accumulation appear to have a baneful effect on certain elements of the population, inflaming their minds with the lust for its possession and causing them to regard it as the legitimate spoils of social warfare. Those afflicted with this passion for seizing something that does not belong to them may aptly be termed industrial buccaneers.

To those who claim that it is expedient to allow the United Mine Workers of America the license to violate the law in order to prevent starvation wages I assert that the doctrine is not only that of anarchy but also that it is based on woeful ignorance of the economic law of wages. The truth is, that under free competitive conditions in the labor market, that is, under conditions where individual liberty is properly enforced, wages in all industries tend constantly to the highest possible figure, being dependent upon the productivity of the nation, and not upon the caprice or greed of employers.

As I said at the outset the industrial questions of the day are all capable of solution by the enforcement of a broadened application of the commandment "Thou shalt not steal." Industrial buccaneering cannot be permitted either by labor unions or by corporations. The members of organized labor and the corporations are entitled to their legitimate earnings and no more. When they seek either by physical force or by unfair methods to reap gains beyond those to which they are entitled under the free operation of supply and demand, when, in other words, they override the legitimate rights of the individual and the general public, they are, to put it plainly, stealing from the rest of the people. And collective theft cannot be tolerated any more than individual theft.

Corporations are needful agencies in cheapening and enlarging production, and their formation and development should be encouraged. Nevertheless, the managers of corporations must come to realize that they have no license to rob the public for the benefit of the stockholders or to rob the stockholders for the benefit of themselves. It is robbery of the public when they seek by the use of certain unfair devices to stifle competition and to charge the prices of monopoly. It is robbery of the stockholders when they use the capital of the corporation to further their own interests, an example of which was furnished us by some of those lately in charge of the great insurance companies.

The efforts of some of those in control of corporations to secure profits which neither they nor the corporations have justly earned have given rise to the demand for Government control of corporations, but such control when it means arbitrary limitation of profits legitimately earned, simply spells socialism, and as a remedy for existing evils should be execrated even more than the evils themselves. The Government has no more right to interfere with the property rights inherent in individual liberty than has a union or corporation. Its sphere of duty is that of protecting public rights, and not that of transgressing them.

It is not Government management of capital that is needed but Government prevention of industrial buccaneering of all kinds. Laws with that end in view, taken together with the growth of higher ideals of social honesty, will solve all the industrial evils now the subject of complaint. The mass of the American people are good honest citizens seeking only what they earn by their own brains and energy. The same despite all the "prejudice writing" of the day and the ranting of demagogues and socialists, can be said of the great majority of corporations. Those corporations and labor trusts, that through schemes of extortion attempt to obtain what they do not earn, are but a small part of the body politic, and they cannot be permitted either to escape punishment or to inflict socialistic oppression upon the nation. They must be made to abide by the laws and the spirit of individualistic institutions, and it is the business of the Government to accomplish this by rigid enforcement of American liberty and the rights of private ownership inseparable from that liberty. It is the business of the government to maintain and protect individualism—not to overthrow it.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

All basalts are not black, nor do all contain olivine, though some varieties carry a large amount of this mineral. Many basalts are reddish, or brown, in color. Peridotites contain abundant olivine crystals.

Novaculite is quartzite of extremely fine texture, suitable for fine whetstones. Its principal occurrence in the United States is in Kansas, though similar rock is found near Buffalo Gap, in South Dakota.

On an inclined tramway having a slope-angle of 35°, the perpendicular pressure on the rails of a ton of 2,000 lb. is 1,638.2 lb., and the stress on the rope, with a factor for friction of 2.5%, is 1,191 pounds.

Eastern investors who put their money into mining enterprises in the West without making any sort of investigation into the merits of the proposition frequently, if not usually, lose the amount of their investment.

Copper ore has been known for years to exist in slate and schist in the vicinity of Rawhide Buttes, Wyoming, north of Fort Laramie, but no production of consequence is credited to these mines. They are in the prospective stage.

Ocher found in ore deposits usually consists of silica and clay intermingled with iron oxide, and is the result of decomposition of ore, sometimes aided by attrition. Ocher is also often deposited from chalybeate springs, forming large deposits.

A sudden change in the character or richness of ore in a stamp-mill, where amalgamation is practiced, is usually promptly noticeable on the outside plates—if the millman is giving attention to his duties—and the proper remedy can be applied.

Wherever washed smooth gold is found on points, bars, and flats, high above the creek-bed of the neighboring gulches or canyons, it may be safely assumed that this gold was deposited in the bed of an ancient stream which at one time flowed at about the level where the gold is found.

The Printer Boy mine, in California gulch, at Leadville, was one of the first vein mines opened in that district. This was many years before the discovery of lead carbonate on Carbonate hill, though placer gold had been mined in California and Iowa gulches prior to the discovery of the Printer Boy, which is a gold mine, the ore occurring in gray porphyry.

Upon locating a mine in a new district, the next step of importance is the location of a water right, if any such be available. Frequently prospectors in new regions are so fully taken up with their latest discovery that they overlook the importance of water supply, which might have been secured but which is promptly appropriated by another.

Mill-launders and flumes carrying tailing should not be built on too flat a grade in cold countries or the material will freeze, causing the boxes to become clogged, the overflow resulting in loss. Flumes carrying clear water may be covered and buried in the earth, in this way preventing freezing, but a stream carrying a large amount of solid material, like mill-tailing, congeals much more easily.

Many large mining companies have found it good business to construct narrow-gauge railroads, sometimes 50 miles in length for the purpose of transporting ore and supplies between mines and reduction works, or to handle timber, fuel, fluxes, and even water. The cost of transportation on such a road depends upon its length, the grades on which the road is built, and the volume of business done over it.

In a modern sampling works all ore handling, crushing, screening and division is automatic, and the results are as accurate and reliable as human ingenuity has been able to make them. The shipper takes no greater risk than the buyer; both must depend on the work of the sampler as a basis for doing business, and the results prove that, with rare exceptions, the properly arranged sampler may be depended upon to furnish a reliable sample of any quantity of ore passed through it.

Pegmatite dikes are frequently the repositories of cassiterite, and it is not unusual to find associated with the tinstone the more rare iron ores, such as wolframite, columbite, and tantalite, besides which there are often present beryls, lepidolite, tourmalines of various colors, biotite, muscovite, albite, orthoclase, and quartz. The iron, and iron-manganese minerals may be separated from the tinstone by electro-magnetic separators, making several products of commercial value.

Rubellite is the pink variety of tourmaline, and when occurring in crystals of sufficient size, free from flaw and of good color, they are valued as gems. Tourmaline possesses a peculiar property known as pleochroism—that of appearing to be of different colors by transmitted light, when viewed in the direction of the different axes of the crystal. This property is sometimes taken advantage of in the optical examination of thin sections of minerals under the microscope.

There are four zones to be recognized in sulphide-bearing veins. A zone of complete oxidation; one of oxidation with secondary enrichment; one of secondary sulphides; one of primary sulphides. The first may owe its precious-metal contents to mecnanical concentration from eroded parts of the vein as well as to residual values, and is not a safe index to deeper parts of the vein. The second may owe its precious-metal contents to chemical concentration as well as to residual values. The third is likely to be abnormally high in base-metal contents as well.

It has been decided by the Supreme Court that where the extra-lateral rights of two mines conflict underground, by reason of converging direction of end-lines, the senior locator shall be entitled to the uninterrupted extension of his vein, on its downward course between the vertical planes determined by the end-lines of his location, extended in the direction of the dip of the vein, and that the junior locator may take a similar right down to the zone covered by the rights of the senior locator, through which he is entitled to a right of way. He may then take his extra-lateral right on the further side of that of the senior locator.

It is supposed that the deposits of calcium borate (colemanite), and other borax minerals occurring in California, were derived from hot springs, the water of which contained boric acid, but which springs are now extinct. Springs of this character are only known to occur in volcanic regions and the only known borax mineral deposits in California are found where volcanic rocks abound. In Lake county, California, some years ago a valuable deposit of borax was discovered occurring as an efflorescence on the surface of a dry lake. A large amount of the mineral was collected and sold at good profit, but the cupidity and ignorance of the owners proved their undoing. They sank an artesian well in the lake bed expecting to strike a body of water saturated with borax, instead of which they encountered a strong flow of fresh water, which covered the floor of the lake, dissolved the borax, and brought their previously profitable business venture to an abrupt end.

The most noted placer mining districts of Honduras are in the department of Olancho, of which Juticalpa is the principal town. The most important gold-bearing streams are the Guayape, Parnel and Jutiape. Along the banks of these streams, which rise in the Guaymaca mountains, after they flow out upon the valley, are extensive deposits of gold-bearing gravel. In the vicinity of the village of Concordia also are large banks of auriferous gravel. Within two or three miles of the latter place, at Llano Viejo, an old mining town now in ruins, are several quartz mines, which evidently were worked many years ago. There are numerous old arastra beds along the neighboring stream, showing that at one period an extensive industry flourished there. The rocks of the vicinity are limestone, mica schist and intrusive dike rocks, particularly diorite. These districts are from 55 to 65 miles westerly from the town of Juticalpa, and nearly 80 miles easterly from Tegucigalpa, the capital of the Republic.

The age of the mineral-bearing rocks in Yavapai county, Arizona, is, for the most part, uncertain further than that they are mostly known to be pre-Cambrian. The sedimentary beds of the Grand Canyon region, which extend from Cambrian to Permian, overlie crystalline schists, and this area of schists, granites, etc., extends for many miles to the southward from the Grand canyon. It is improbable that these schists contain mineral veins carrying gold, silver, copper and other ore, but in the Grand canyon these are rendered almost valueless by reason of the extremely rugged topography of the country. In some portions of the canyon the overlying Cambrian rocks also contain ores—chiefly those of lead and silver, particularly in Cataract canyon. Some development has been done on these deposits, but like the veins in the schists, they can only become commercially valuable when a cheap means of transportation, from the depths of the canyon to the plateau at the top, has been provided.

Sinking vertically through sedimentary rocks which lie nearly flat, and which show many alternations in the character of the beds composing the strata—one stratum being hard, and the next soft—will often occasion much difficulty in blasting, particularly when the several strata are only a few feet or a few inches in thickness, as is often the case in unmetamorphosed sediments. When drilling through a hard layer, upon the drill-bit reaching the bottom of the stratum, a blow from the hammer drives it suddenly and unexpectedly downward, perhaps several inches, into the underlying soft stratum. To fill and tamp the hole in the soft material, effectively, so that the powder will blast out the hard overlying rock is a difficult matter. It is usually the better plan to abandon the hole and drill another near it which will be deep enough to blast out the hard layer, when the soft bed beneath may be picked out. Occasionally the bottom of the hole, which has entered the soft ground, may be chambered with a half-stick of dynamite, and the chamber filled with black powder. It is then an experiment whether the black powder will enlarge the chamber previously made, or break the hard layer above it. The situation is one requiring experience and good judgment on the part of the miner.

Sedimentary rocks are those formed of the material derived from the disintegration of other older rocks. This material forms conglomerates, sandstones, or shales, depending upon the character of the rock supplying the detritus, and also to some extent, upon the distance it has been moved, the carrier being most commonly water. The coarser materials are first deposited, such as the silt, sand, pebbles and cobbles forming conglomerates on a sea or lake shore. Sediments carried in suspension by rivers settle to the bottom when the current becomes sluggish, on entering the deeper water, the coarser sands being deposited first while the finer silt is carried many miles further. The sorting action of the water is perfect, and the only difference observable in sedimentary deposits thus formed is in the stratification produced by the varying volume and character of the materials brought down by the stream at the several seasons of the year. Thus, in stages of high water the stream will discharge a much larger amount of sediment, which will average coarser than that carried down during low water. Volcanic ejecta—rocks, sand, ashes, and mud, may also be carried by streams into deep water forming sedimentary rocks upon consolidation.

Concerning the location and recording of mining claims, the United States law says: "The miners of each district may make regulations not in conflict with the laws of the United States, or with the laws of the State or Territory in which the district is situated, governing the location, manner of recording, amount of work necessary to hold possession of a mining claim, subject to the following requirements: The location must be distinctly marked on the ground, so that its boundaries can be readily traced. All records of mining claims hereafter made (May 10, '72) shall contain the name or names of the locators, the date of location, and such a description of the claim or claims located by reference to some natural object or permanent monument as will identify the claim, etc." It will be noticed by the foregoing that miners may organize districts and may also determine the manner of recording. This, without doubt, contemplates the election of a local district recorder, and any record of location properly made with him in accordance with the United States statutes would be perfectly legal. The language of the Civil Code of California, Section 1159—"notice of location may be made with the county recorder," etc., does not make it compulsory. A safe plan would be to record a location with both the district recorder and the county recorder. The county records are usually kept in a safe place where they are not likely to be destroyed by fire or otherwise, while in many cases those of the district are exposed to danger of destruction. If a mining claim is worth anything it is worth recording in such a manner as to insure the validity of title.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

THE TREATMENT OF DESERT ORES.

The Editor:

Sir—One of the first requisites of good criticism is that the critic shall at least give his victim a fair hearing. I refer to certain strictures, in your issue of April 28, on a brief article of mine touching upon ore treatment in the Tonopah-Goldfield district. If unwittingly I have trodden rough-shod on any of Mr. Bertram Hunt's metallurgical hobbies, I am sorry; but before proffering a formal apology I must ask him to do me the justice to re-read my article, which he so bluntly dismisses and so obviously misunderstands.

In reference to the necessity of amalgamation at the Combination mill at Goldfield, I was not undertaking, as Mr. Hunt infers, a general discussion of the treatment "of oxidized ores of the desert regions of Nevada and California." The classification of 'desert ores' is Mr. Hunt's own. It seems to me a poor one, because all sorts of ores are found in the desert, requiring various modes of treatment; and variations quite as pronounced are found in mountainous regions and high altitudes. Hard ores are found in the desert, as well as soft ores; oxidized as well as sulphide; and any technical man familiar with desert conditions, especially those observable at Tonopah, Goldfield and Bullfrog, would hardly fall into the blunder of making so meaningless a classification.

I was not generalizing when speaking of ore treatment at the Combination mine. I was plainly referring to a specific case of an unusual type of oxidized ore, peculiar to a limited district. Mr. Hunt advocates dry crushing as applied to the soft, oxidized porous ores of the desert, under the impression, evidently, that this is the sort of ore found at Goldfield, and that it is characteristic of the deserts of Nevada and California. This is an error into which others have fallen who are not acquainted with the southern Nevada fields. The oxidized ores of Goldfield are not porous, and they are not soft; in fact they are extremely hard. The ore of the Combination mine has been described as a silicified andesite. It is so hard and tough and fine-grained that selected pieces of it have been considered suitable for replacing the flint pebbles in the tube-mill used for re-grinding the softer sulphide ore. Some idea of its hardness may be gathered from the fact that 1,300-lb. stamps, with 6-in. drop, falling 100 times per min. will, under the best conditions, put only 3 to 3½ tons per stamp per day through a 12-mesh wire screen.

Mr. Hunt bewails "the present fashion of putting in stamp-mills and amalgamating arrangements followed by a cyanide annex, as due solely to the compelling power of custom." If such is the prevailing practice, it is much to be deplored; and I regret it no less than he. But the allusion so palpably insinuates that I have offended in the case of the Combination mill that I hasten to relieve Mr. Hunt's anxiety on this score by offering a few facts.

The Combination mill at Goldfield was not installed until the treatment of the ore had been thoroughly investigated. This required about six months. Laboratory tests were confirmed by milling tests. Dry crushing was given a fair trial, but the extraction in each instance was poor; and after fifteen days' leaching with the ordinary strength of solution used on gold ores, it was still found possible to pan from the tailing considerable quantities of gold undissolved by cyanide. Several strengths of solution were tried; the ore was reduced to various degrees of fineness; and still dry crushing was not applicable. Finally wet crushing under stamps, followed by amalgamation, concentration and cyaniding, was found to be the proper treatment, and was adopted. I do not propose to enter here into the details of treatment, as I am reserving this for a special article. But suffice it to say that contrary to Mr. Hunt's belief, the matter of ore treatment was given a thorough study; and we were not, at least in this instance, the slaves of custom.

In regard to the recovery of gold on plates; I would certainly advocate the use of amalgamation where as much as 50% of the gold can be so recovered. Mr. Hunt is possibly not familiar with the character of the gold found in the Goldfield district. It is fine, to be sure, as distinguished from the coarse gold of the California Mother Lode, which yields such high results to amalgamation; but it is not by any means invisible, and most of it can be 'panned out' in an ordinary miner's pan. In other words, it is too coarse for direct cyaniding and too fine for the best results by amalgamation. Moreover, Mr. Hunt has evidently not considered the great advantage of being able to secure daily from plates 50% of the extraction obtained from $50 ore, as compared with waiting for the tedious monthly or bi-monthly clean-up in a cyanide plant and his suggestion that amalgamation be tried after cyanide treatment by passing the tailing "over some amalgamating device," while no doubt ingenious, will hardly appeal seriously to practical mill-men. And what, let me ask, does Mr. Hunt propose to do with the very high-grade concentrate obtained from this ore, which it pays so well to extract and ship? Must this also be removed after cyanide treatment?

My critic's views on this whole subject are summed up in his query, "As the majority of these oxidized ores give a practically complete extraction by direct cyanide treatment, what is the advantage of using both amalgamation and cyanide to recover the same value?"

My answer is that I do not admit the correctness of Mr. Hunt's premises. He is evidently an ardent advocate of dry crushing; and while I did not intend to prolong this discussion into a consideration of the respective merits of the two processes, I cannot refrain from mentioning some of the more serious limitations of dry-crushing. A few years ago I was happily instrumental in converting one of the largest dry-crushing plants in the West (that of the Gold Road mine in Arizona) into a wet-crushing mill. It was an expensive and well-equipped plant and had been in operation several years; and so far as I could see, it had been worked to its highest efficiency. The extraction obtained was about 80%. The change to wet-crushing, using Huntington mills in conjunction with the coarse rolls already installed, and Dehne filter-presses to handle the slime, raised the extraction 10%, and considerably decreased the cost of treatment. Amalgamation, in this case, was dispensed with altogether, as only about 15% of the value could be so recovered. Two other representative dry-crushing mills, one in Utah and the other in southern California, are now considering the remodeling of their plants for dry-crushing, after obtaining promising experimental results.

These projects and changes are all based upon the following facts, which I believe will sooner or later reduce the applicability of dry crushing to a few rare and isolated cases: (1) The impossibility (from an economic standpoint) of reducing ore to a sufficient fineness to ensure the best recovery, without making percolation prohibitively slow. (2) The now generally accepted view that the product of any ore-crushing mill must be handled either as a slime, or as classified sand and slime. The slime requires short treatment with weak solutions; the sand, long contact with stronger solutions. Every modern mill, operating on a logical basis, must handle its final cyaniding material as two separate products.

Aside from the great discomfort to workmen in a dry-crushing mill, and the resulting well-grounded prejudice which they have against these mills, the great fundamental objection to this type is that it is not adapted to the requirements of the latest and best practice in cyaniding. An exception to this would be in the treatment of a porous ore containing little or no amalgamable gold, and requiring hardly more than breaking, like the ore formerly treated in the old Mercur plant, or an ore which requires roasting before cyaniding. Conditions so ideal for dry crushing are rare; at least they are not common enough to affect the general rule prescribed above.

Mr. Hunt mentions, among the objections to wet-crushing, that the moisture in the ore must be displaced, entailing a loss of cyanide. This would be a very serious matter indeed if there were no conceivable objections to dry crushing. Each method, of course, has its objectionable features. The discussion of so important a subject should be undertaken in a fair and liberal spirit; the merits and demerits of each process carefully weighed; and obviously the final choice accorded to the method which has the preponderance of commercial advantages as applied to a particular ore. After a careful study of the two methods, and some experience in both, I, for one, am persuaded that the present recognized need of fine grinding in cyanide work, and the treatment of slime as a separate product, will ultimately reduce the field of dry-crushing to a very limited scope.

FRANCIS L. BOSQUI.

San Francisco, May 10, 1906.

BLAST FURNACE VS. REVERBERATORY.

The Editor:

Sir—I feel that Mr. Mathewson's article in your issue of March 24 would do us lots of good if we could manage to figure out his diagram there given. In the diagram, where is the line of no values and in which direction do they increase? If a two per cent copper ore carrying 30% silica fetches the amount shown next to 30 on the bottom line of the diagram, will the next value of a two per cent ore of 70% silica be shown next to 70 on the same horizontal line? Will the value of a seven per cent copper ore with 30% silica be shown on the horizontal line 7 and the inclined line 30, and will a 7% ore containing 7% silica be found on the same horizontal line? Also where shall we find the net value when treating the latter in a reverberatory?

It would be interesting to know what it costs to treat a ton of materials at the blast-furnace, that is the ore and flux, excluding the weight of the coke and the cost of the flux.

AN OLD SUBSCRIBER.

Chicago, May 12, 1906.

INFORMATION WANTED.

The Editor:

Sir—The Laurentian mine, near Dinorwic, in Ontario, Canada, on the Canadian Pacific Railroad, about 200 miles west of Port Arthur, is pumping water from a lake to its 20-stamp mill, a distance of 3,000 ft. against a head of 120 ft., through a 5-in. standard black-iron pipe. The line is entirely above ground, supported by wooden trestles of varying heights up to 26 ft., giving a uniform grade so that the pipe may be drained when not pumping. During the winter the temperature is often 45° below zero, thus requiring a covering for the pipes to keep the water from freezing.

Should any of your readers have had any experience in protecting water-pipes from freezing under similar conditions I would be pleased to have them advise us in your columns. ANTHONY BLUM.

Gold Rock, Ontario, May 8, 1906.

Lead Pencils are not made of lead, as some suppose. They are made of graphite and clay. Graphite is mined in much the same way as coal. The greater part of the graphite comes from Bavaria. After being mined, it is sent to the pencil factories, where it is ground to powder and mixed with finely pulverized clay. On the amount of clay depends the degree of hardness or softness of the pencil. The greater the portion of clay, the harder the pencil, and vice versa. This mixture is thinned with water and repeatedly ground until it is perfectly smooth and free from grit, after which it is placed into canvas bags and squeezed until sufficient water has been removed to make it of the proper consistency. It is then placed into a strong cylinder with holes at one end of the same size as the leads which it is desired to make. A descending piston forces this mass through the holes in long strings, which, after being thoroughly dried, are subjected to intense heat, after which they are ready for their wooden cases. The wood part of the pencil is usually made of red cedar. This is sawed into small strips, grooved, lead inserted and the strips glued together, after which they are rounded, polished, cut into the proper lengths, etc.

Oil in Illinois.—The oil fields recently found in eastern Illinois continue to develop and have now reached a production of over 60,000 barrels per month. The oil is of good grade, yielding about the same percentages of the lighter distillates as the Indiana oil. The wells produce from 5 to 25 barrels a day, and while there are no gushers known, they have not yet been exhausted, although some have been pumped since last June. The proved territory extends from Westfield, in Clark county, to Robinson, in Crawford county, and is perhaps connected with the Mermon, Indiana, field. The oil is found in the coal measures at depths of from 300 to 900 feet.

Cement in 1905.—A preliminary statement on the production of hydraulic cement in the United States during the calendar year 1905 has been issued by the United States Geological Survey. It shows that the total production of all kinds of hydraulic cement in 1905 including portland, natural rock, and slag or puzzolan cements, was 40,894,308 bbl., valued at $36,012,189. This was an increase of 9,219,051 bbl., valued at $9,980,269, over the production of the previous year. Of the total amount of cement manufactured in the United States in 1905, 36,038,812 bbl. were portland cement with a value of $33,326,523; 4,473,049 bbl. were natural rock cement valued at $2,413,052; and 382,447 bbl. were slag or puzzolan cement, valued at $272,614.

Joplin Re-visited.

Written for the Mining and Scientific Press by
F. Lynwood Garrison.

After an absence of over six years it is interesting, and perhaps instructive, to note a few of the changes which have taken place during that period in this remarkable mining region. The most striking characteristic of what is known as the Joplin district, is the enormous area it covers. The numerous small mining towns and camps comprising it are scattered over a large section of southwest Missouri and a few miles across the border into Kansas and Indian Territory. This condition is due to the fact that wherever lead and zinc ores were discovered in any quantity, camps and small towns sprang into existence. These places are often many miles apart, but they are all evidently in one and the same mineral area and horizon. Gradually the intervals or gaps between these towns are being prospected, and I venture to say in most cases where this work has been carefully and intelligently done, ore has been found. Deeper drilling and closer prospecting will certainly tend to uncover orebodies in ground previously supposed to be barren, and, with a better understanding of the structure and nature of these deposits, it is to be expected that this development will continue.

As a result of such development, this entire territory is likely to be sprinkled with a multitude of new producing camps, a few of which may prove to be as rich and as extensive as any yet found. Some of the older mines, notably those close to the settlements of Joplin and Webb City, have probably been pretty well exhausted; but I make this statement hesitatingly in view of the repeated instances of old workings, given up as thoroughly depleted, becoming once again producers. The supposition that the ore reserves of the district are becoming exhausted is certainly not justified. My own opinion is that their extent is but just beginning to

BOILER FIRED WITH OIL.

be realized. Whether the new finds will continue to be as rich I doubt, for the tendency seems to be to discover larger bodies at greater depth, but of much leaner character. These deeper lodes are probably the primary aggregations not enriched by secondary concentration, as in the case of the shallow deposits.

That there is likely soon to be an over-production of zinc ore, I do not believe; at the best the orebodies are relatively small and scattered, hence it is extremely improbable that the cost of production can be materially reduced notwithstanding the economic advantages possessed by the district as a whole such as natural gas, cheap electric power, etc.

The subject of labor is becoming a rather serious one in the Joplin region. The scale of wages eight or ten years ago ranged from $1.25 to $2 per day. Now, for the same work, they average from $2 to $2.75, and in some cases, I understand, even more. This increase was, of course, justified by the greatly enhanced price of zinc ore, but it is doubtful whether the very high rates for ore that have prevailed for the past year can be maintained in the near future. It is probable that the average operator in this district is usually working on a small margin of profit between the cost of his ore and its market value. In view of this condition and the fact that the cost of food is nowhere lower in the United States than in and about the Joplin district, such a great increase in wages is apparently unjustifiable. Whenever a great drop comes in the price of zinc ore, as it will inevitably, it surely will be difficult to reduce wages proportionately, and the operator will then have to suspend, pending better prices for his product.

On the whole the personnel of the labor here is good, pure American stock. The miners are recruited mostly from the farms of southern Missouri and eastern Kansas; there are but few foreigners among them, and the miners are, as a rule, as good a lot of boys as could

YELLOW DOG MILL.

be desired. Labor unions have never been successful in organizing in this region, chiefly for the reason that conditions here are peculiar in that a miner who is working for wages today, may tomorrow become an operator. Many, if not most, of the operators have begun as miners; hence the relations between operator and miner have naturally been sympathetic, and this should make possible an amicable adjustment of the cost of labor to the price of ore.

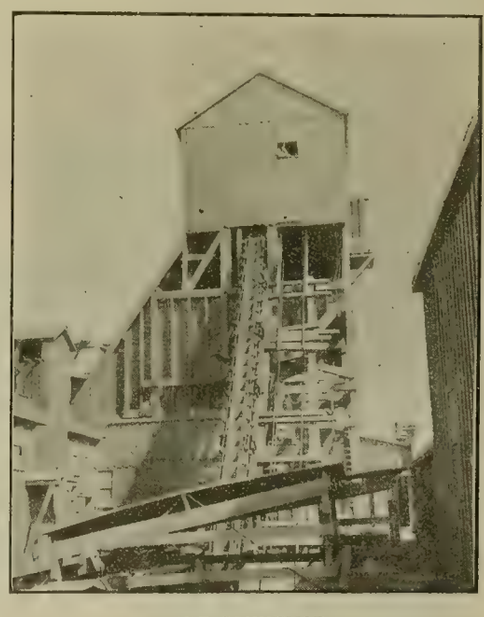
The introduction, within the past six months, of natural gas from the fields of eastern Kansas, has placed Joplin in an enviable position as regards fuel. This gas is sold to the operators at 10c. per 1000 ft. when used under boilers to generate steam, and 25c. per 1000 ft. when consumed in gas-engines. The method of applying it to a boiler previously using coal, is very simple, as is well shown in the accompanying photograph. A few feet back from the nozzles, a checker-work of firebrick is built upon the hearth which acts as a baffle-plate or wall upon which the ignited gas impinges, thus spreading the flame and preventing a too rapid escape of heat up the chimney. The pressure is regulated and the gas measured by suitable apparatus placed a few feet outside the boiler-house.

In addition to this cheap form of fuel, the operator has the option of taking electric power from the new central station of the Spring River Power Company situated on Spring river at Lowell, Kansas, a short distance across the border from Joplin. Here a substantial and excellent plant has been established with eight turbines, four connected to each of two 2000 h. p. dynamos. As the water flow at times is apt to be rather irregular a supplementary steam-plant is being installed by this company that will give the requisite power should the water fail temporarily. The electric service sold by this company to consumers costs from one to four cents per h. p. h., depending upon the amount used. Certain discounts reduce this cost somewhat when large quantities are used.

I have been unable to find much improvement in the general milling practice of the district as a whole. Some mills grind a little finer and use tables, but the waste in the average mill is still great. While from an academic standpoint such extravagance appears inexcusable, I believe, from the practical result, that the Joplin mill justifies its continued existence. It is crude, but cheap, and can be moved easily in this flat country from place to place; in fact, it may almost be considered itinerant. The pockety nature and irregularity of the orebodies rarely justifies a large and complete plant; moreover, for the same reason large custom mills are not favorably regarded. The chief objection to the small individual mill is the relatively enormous expense of power generation, and the impossibility of such plants affording first class superintendence. The first difficulty is, as we have observed, being overcome by the use of gas and electric power; while the second may be, and perhaps is being, met by the consolidation of a number of small properties under one management. Certainly, more low-grade ore is now being treated than ever before. By 'low-grade', I mean a raw ore that contains about three per cent of zinc-blende or 'jack' per ton. A more general use of electro-static separators will also tend to greater economy, especially when used with concentrating tables. Although there is much room in this district for improvement in both mining and milling practice, the engineer who visits the place for the first time should not jump to conclusions regarding the crudities he witnesses. The operator here is a very practical person, he seldom has the means or the desire to secure highly skilled engineering advice. No doubt he would save money thereby in the long run, but he usually knows his business and often makes a success, where perhaps a more highly trained technical man might fail. Certainly college-trained mining men are conspicuous by their absence in this region, though, of course, there are some successful exceptions.

One of the novelties I observe here is the mill near Webb City, shown in the accompanying photograph, and known by the classic name of Yellow Dog. Its chief peculiarity is that the ore is raised from the mine by a bucket-conveyor arranged upon a kind of link-belt affair; the construction is simple as will be seen from the photograph. Such an apparatus is possibly effective, but I have some doubts as to its economy. It is true the lift is not great and the weights are relatively small. This mill is also exceptional in being completely equipped with electric power from the central station at Lowell.

The prosperity of Joplin is well indicated by its busy business streets and the substantial and expensive character of its new private residences. It also boasts of a really handsome post-office building, a Carnegie library, Elks Club, and several handsome new churches. With such remarkably cheap fuel, excellent railroad facilities, cheap land and good water, Joplin should become a manufacturing center. The district is so favored by nature that my modest account of its advantages may appear like an exaggeration and give this article an aspect of what I believe newspaper folk call a "write-up." Certainly nothing of this kind is intended. To show my sincerity in this respect, I should perhaps



ORE CONVEYOR.

end up by saying something nasty about Joplin. Well, I must think! Its dames are fair and its men are brave, but it is awfully hot and disagreeable during fly-time in summer and it has more saloons to the inhabitant than any other town in Missouri.

The advance statements of the Canadian Geologists are included in the summary reports of the Geological Survey of Canada. The volume for 1904 of this series has recently appeared, but some of the separate articles were printed many months ago. A praiseworthy feature of this publication is the illustration by maps reproduced in colors. It appears that the Canadians have found means of producing illustrations in color expeditiously and in this respect are ahead of the survey in our own country. The value of this series would be much enhanced by the inclusion of an index to each volume. While most of the reports are concise statements, some could be condensed without losing anything essential. The publication would gain both in clearness and attractiveness if a more logical and less monotonous form of paragraphing were adopted.—A. H. Brooks in Economic Geology.

Notes on Tube-Mills at El Oro, Mexico.

Written for the MINING AND SCIENTIFIC PRESS by CHARLES BUTTERS.

Foundations.—The management of El Oro Mining & Railway Co. had a good deal of trouble with the foundation of one tube-mill, due to improper setting of the cement. There is a terrible vibration when the mill is running. It would be best to make the foundations ten per cent heavier than the plans usually called for, using the very best cement, and allowing sufficient time to set clear through before the tube starts. Underneath there should be a good cement floor sloping to a gutter leading to the cone, spitzkasten, pump, or wheel, constituting the return circuit, so that the floor can be washed with a hose, the washing being returned with all leakage of mills for re-grinding.

Rotation.—It is important that the tubes rotate in a direction such as to cause the thrust of the driving pinion to be downward into the pillow-block, and not up against the cap; the rotation should be effected by an open belt, if possible. If in accomplishing this the mill runs backward, it is best to reverse the spiral in the feed-throat, as the spiral is the only thing that makes any difference to the direction of rotation. The spiral at the discharge end can be removed altogether, as it seems to be of no practical value, mills working just as well without it, as others with it on the same work.

Leaks.—A leak will often start around a bolt when it is impracticable to shut the mill down. If there is a cement floor, it will make no difference, or a bolt may cut out entirely. In this case, feel in the hole with the finger and if the liner is good, put a wooden plug in the hole until such time as is necessary to shut down for more extensive repairs. If the leak occurs at the head of the mill, the sand will get into gears and cut them badly. This can be obviated by putting a shield on the gear-wheel rim, to cover outside ends of teeth, by fastening (with cap-screws) a ring cut from sheet-iron No. 14 or 16 gauge. This should, by all means, be done before the mill is set up.

Feed.—In case the feed-hopper and the pipe that enters the mill come in one piece (as they did at El Oro, cut the pipe off as close to the hopper as possible, and put in a flange or sleeve, threaded in direction, so that the rotation of the mill will not screw it off. The pipe will have to be made a little longer than the piece cut off, as the connection will necessitate setting the hopper further back, in order to get at the packing gland. There is a great deal of wear on the pipe. By this means it can be quickly and easily replaced. The best packing to use is ⅜-in. common hose cut in individual rings. There should be a de-watering cone, or pulp-thickener, directly over the feed-hopper, to get the pulp as thick as possible for the mill—1 to 1, or less. The overflow from this can be carried over the mill into the discharge-box to dilute the pulp again so as to make it flow through launders.

Platform.—There should be a platform over each mill, with a hopper over each man-hole for putting in pebbles, and the pebbles should be brought in at this level if possible, to avoid elevating them. The lifting of pebbles into the side of the mill is a slow and laborious job. This platform would give access to the pulp-thickening cone also. With everything arranged in the most convenient manner, the mills should run a maximum of 29½ days per month. If there are only a few pebbles to put in, two or three men will distribute them easily, but if there is a great quantity to add it is quicker to fill the mill full up to man-hole, put on the door temporarily, and give the mill a few turns to distribute them, repeating the operation until sufficient pebbles have been introduced. At El Oro they keep the mills one to three inches more than half-full, by measurement from top tube to pebbles. When the mill is opened for repairs the foreman measures the pebbles and can tell the workmen just how many sacks to add. They never allow them to wear down more than four inches before refilling.

Liners.—The Krupp liners at El Oro are 1½ in. thick, of chilled cast iron; the chill is only about ¼ in. deep, and when it wears off, the balance of the plate wears much faster. The wear on the plates is chiefly at the head of the tube, and diminishes with each row of plates toward the tail. The average life of Krupp plates being 40 days, with mill No. 3, running 32 rev. per min., containing 7½ tons of pebbles and grinding 125 tons of sand per day, of a very hard quartz, producing about 50% of material that will pass 200-mesh, 40% of the remainder being between 100 and 150-mesh. They are now making their own plates, 1⅛ in. thick, of white cast iron, not chilled, but it is run in very thin sand molds. The founder has a formula for this casting, which produces a very hard metal clear through, and wears evenly and equally down to a quarter inch or less. It was not possible to get the exact composition of the iron, but any intelligent foundry-foreman could soon test it out, as a hard, white casting is made by using re-melted iron until it is very low in silicon, and adding a little sulphur. No. 3 mill has four rows of plates, with three holes each. The length is to be changed, making three plates with two holes each to take the place of two plates, and make them 1½ in. thick. At El Oro they never empty the mill to re-line it, but put in one or more plates at a time as needed, with the pebbles all in. Thus the 1½-in. short plate will be lighter to handle than the 1⅛-in. long plate, it will last longer, and if one breaks before it is worn out (as they sometimes do), there will be less iron to throw away. These plates wear much longer than Krupp plates, and cost just half as much. The plates must be cast true to curve, the holes very carefully cored, and the bolts forged from common iron to exact taper of hole. When the plates are put in, see that the core sand is thoroughly cleaned out of hole; place two men inside and two outside of mill; take two rods 2 ft 6 in. long to pass through the holes, so that the men outside can help to lift the plate, the rods guiding it to exact position. The men inside can easily hold it in place, while the rods are removed, one at a time, and the bolts put in. Drive the bolts to a firm and close seat, with a sledge, while the nut is being tightened with a 2-ft. wrench, using a washer and gasket of ⅛-in. sheet-packing under the nut. If the plates are well put in so there is no spring and the bolts fit perfectly, they will wear evenly down to ¼ in., without breaking or causing any trouble. Four men, after they become familiar with the work, will take out old plates and put in new at the rate of about three per hour.

At El Oro they have found that the end-discharge plate or grating discharged pebbles too large, causing undue waste, and have thus replaced these with others containing oblong holes ⅝ in. by 1½ in., there being 48 holes in each half plate. An experimental run has been made with mills in series, that is, running all the coarse sand into one mill, and the fine return sand into a second mill. The consensus of opinion is that this is the best and most economical method and they are installing two new mills, to be put in series with the old ones. The pebbles discharging from the first mill are put into the second, where a fine discharge grate is used, the pebbles finally issuing being not more than ⅜ to ½ in. The discharge must be into an open box containing a screen with about ¼-in. holes to catch the pebbles. They have in use a No. 5 mill, 5 ft. diam., 27 ft. long, inside measure, running 28 rev. per min., containing 16 to 17 tons pebbles and 8,640 kilo. liners, requiring 107 h. p.; a No. 4 mill 5 ft. by 24 ft., 28 rev. per min., containing 11 to 12 tons pebbles, 7,520 kilo. liners, and requiring 85 h. p.; and a No. 3 mill, 4 ft. 1 in. by 19 ft. 9 in. running at 32 rev. per min., containing 7½ tons pebbles, 4,520 kilo. liners, requiring 60 h. p. They have determined, after several months' careful observation, that the No. 3 mill is the most economical and efficient to use, and, in future, they will install no other size.

The consumption of pebbles and liners for the months of October and November, 1905 (mills running 95% of the time), was:

	October.		November.	
Mill No.	Pebbles	Liners	Pebbles	Liners
	Kilo.	Kilo.	Kilo.	Kilo.
3	5,165	1,365	5,370	1,360
4	8,625	729	10,625	2,589
5	7,987	1,345	16,310	2,589
Total,	21,777	3,439	32,305	6,538

The mills were grinding about 8,700 tons per month of battery sand, besides the return sand.

In my opinion it would be a great advantage to have the liner-plates short, as mentioned above, for there is little room in a No. 3 mill; no more than two men can work to advantage, and the plates should be light enough, so they can be handled quickly and easily. But it would be a great mistake to make them with only two holes, because if a bolt cut out, the leverage of the plate on the other bolt will soon break it, causing an endless amount of trouble, necessitating a shut-down to replace a bolt at once. With three bolts in a plate, if one comes out, the other two will hold the plate firmly in position until such time as is necessary to shut down for more extensive repairs.

San Francisco, Dauntless.

The California Promotion Committee issues the following truthful and interesting statement:

On April 18, 1906, San Francisco experienced an earthquake followed by a disastrous fire of four days' duration which swept over four square miles of densely populated area.

The earthquake did some damage to poorly constructed buildings, but it was demonstrated beyond a doubt that the modern building of the higher type is not affected by seismic disturbance.

The disastrous effects of the fire were appalling, the loss running into the hundreds of millions of dollars with insurance of possibly two hundred millions. All of these millions and more will seek reinvestment.

Fortunately the water front was not seriously damaged and the vast shipping through the finest harbor in the world was but little disturbed. Many manufacturing plants and a large section of the residence district of the city remained intact.

Within a few days after the catastrophe street cars were running on several streets and on Market Street as far as the Ferry. This traffic was extended day by day until now it is fast approaching normal conditions.

At three o'clock on the afternoon of April 18 a Citizens' Committee was organized for relief and for the regular business of the city. This provisional government by committees worked in admirable harmony with the mayor and Federal authorities and at once developed an orderly and wonderfully efficient plan of operation.

The health conditions remained wonderfully good. At no time was an epidemic threatened. The loss of life was comparatively small, many a minor catastrophe in recent history having resulted much more disastrously in this respect.

Business confidence remained unshaken after the disaster and the banks all demonstrated their solidity. At no time was a panic threatened. Before the ashes cooled wholesale and retail trade was resumed in original places where the buildings remained and in temporary structures in cases where the buildings had been burned.

The people of San Francisco, millionaires and wage-earners, refugees and householders, showed a spirit of fortitude and optimism probably unequalled in the history of the world.

San Francisco is now in course of reconstruction; the debris is rapidly being removed and the hum of industry has supplanted the roar of the flames. The abiding results of the fire will be wider streets, more imposing edifices, larger parks, and a complete fire-fighting system which will utilize the waters of the ocean. The real estate market weathered the storm and shows great activity.

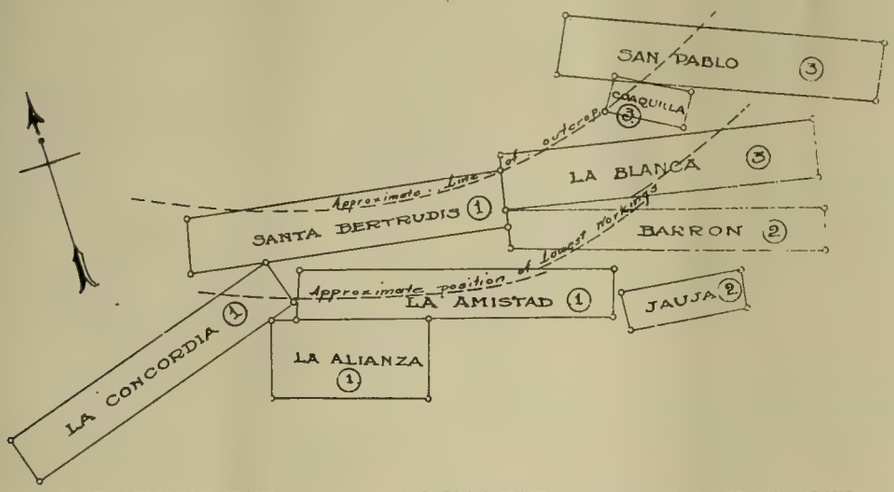
San Francisco is the city of opportunity. The vast fertile country back of it promises the yield of an exceptionally good year's crop. The chance for business investment is magnificent; Eastern and local money will be poured in freely while the rebuilding progresses. The history of all such events as that which has just transpired proves that the ultimate result is a general improvement in conditions and a vast increase in community wealth.

Quartz Glass.—Pure quartz melted down to glass has numerous valuable properties not possessed by any other kind of glass. It expands less than one-tenth as much as common glass upon heating; it can be heated to 1000° C. without becoming soft, and it has been found to transmit ultra-violet rays with freedom. These properties make quartz glass an article of great value in the laboratory. Numerous experiments have been tried in an endeavor to produce quartz glass in amounts which would make it of practical utility. After many trials and failures it was found that a mass of pure quartz, either transparent or milky, could be readily melted, and be freed from damaging air vesicles, by placing in an electric furnace of such construction as would permit subjecting the charge to compression of air. The quartz was rapidly heated to above 2,000° C. before the air pressure was applied, after which the temperature was lowered to the proper point. The result by this method was the repeated production of sheets of quartz glass 3 by 5 by ½ in., almost entirely free from objectionable air bubbles, those present being small and not numerous. The presence of metallic oxides of any kind, even in very small amount, renders the glass unfit for use, making it almost black and opaque. The quartz must be free from impurities of every kind, or the glass produced is opaque.

Pachuca.

Written for the MINING AND SCIENTIFIC PRESS by
H. E. WEST.

Pachuca, in the State of Hidalgo, is 62 miles northeast of Mexico City. The town is situated at the foot of a range of barren hills, of extrusive origin, built up mainly of andesite. The altitude is about 8,000 feet above sea-level. The topography is mountainous and broken. The immediate vicinity is unattractive, except in the neighborhood of Real del Monte, where there are beautiful 'bosques' or woods, principally of oak. The climate is not equal to other portions of the southern tableland. The winds are most disagreeable, and in winter decidedly chilly. During the past winter there was twelve inches of snow on the hills around Real del Monte; this, however, is exceptional.



1. SANTA GERTRUDIS GROUP. 2. BARRON GROUP. 3. LA BLANCA GROUP.

A NOTABLE SERIES OF MINING PROPERTIES.

The district, as a producer of precious metals, is a very old one, and was one of the first worked by the Spaniards, three centuries or more ago. As is well known, it was here that Bartolome de Medina discovered the principle of amalgamation in the early sixteenth century, and developed the famous 'patio' process, through which, until recent years, all the enormous silver production of Mexico was extracted.

The Real del Monte and the Santa Gertrudis mines are the oldest in the neighborhood. The latter has paid the present company—not the only one to own and work this rich piece of ground—403 dividends, and today pays regularly a monthly dividend of one peso*, or about 17% on the present market value. The Amistad and Concordia are the 'deep-levels' of the Santa Gertrudis, and all ore now comes from these properties, the outcrop mine having been worked out many years ago.

Looking at the Pachuca of today there appear to be three centers of activity: The Real del Monte district, five miles northeast of Pachuca; the Santa Gertrudis, three miles east; and the San Rafael, two miles north of the town. Even after some forty years of continuous development, the depth attained anywhere in the district is very moderate. The Real del Monte and Santa Gertrudis have gone down the furthest, and in no instance has the 2,000-ft level been passed.

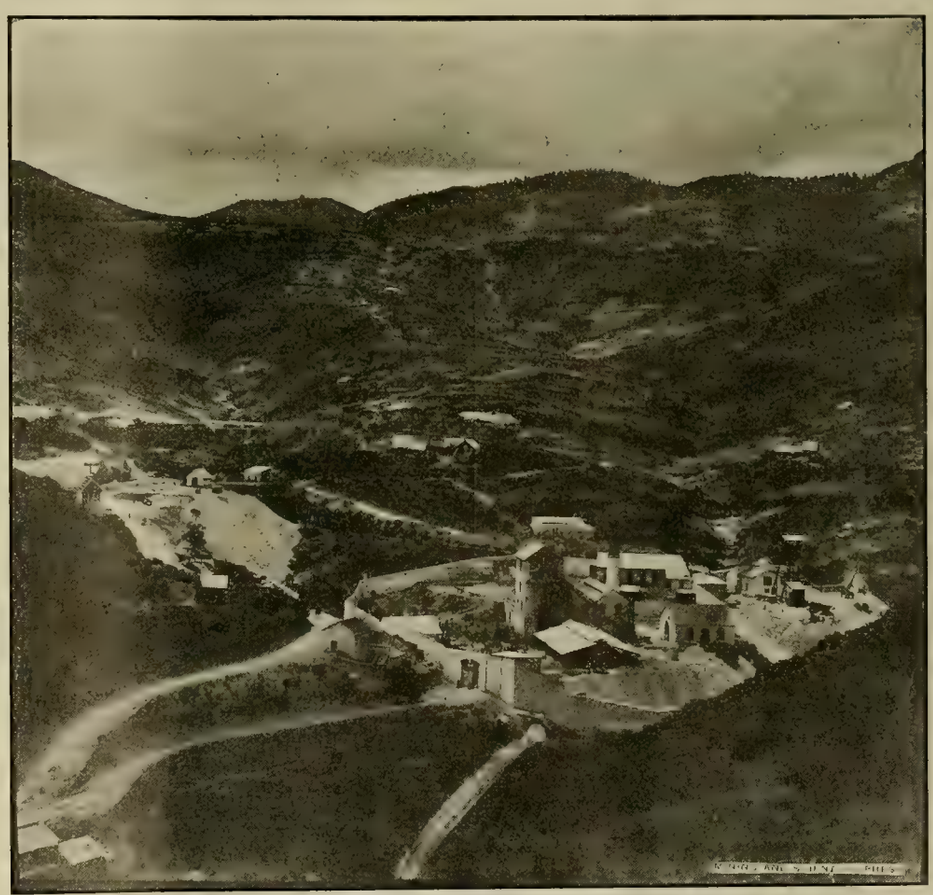
Recently the entire Real del Monte property, both in Real del Monte and also in Pachuca, changed from Mexican to American ownership, at a figure, it is stated, of $2,000,000, for the controlling interest. Such a sum is a moderate valuation for such an enormous area, comprising, as it does, some of the richest ground in Pachuca. The Barron claim, on the Santa Gertrudis vein, ought to be capable of returning the entire purchase price.

Water has been, and still is, the great difficulty in the working of the Real del Monte property. It is mostly pumped from the Difficultad shaft, where there has been installed for the last ten years a large compound pump, somewhat on the Cornish principle, although of German manufacture. The pump-column is some three to four feet in diameter, and the pump has a rating of five million gallons per 24 hours from a depth of about one thousand feet. This pump is now idle, having been superseded by a four-stage motor-driven centrifugal pump, which is now sending from 2,000 gal. per min. in the dry season to 2,400 gal. per min. in the wet season through a vertical height of 730 feet. The induction motor is of 750 h. p. at 900 rev. per min. This pump has proved a great success. In addition, an electrical centrifugal sinking-pump is hung in the shaft ready for any emergency. Speaking of pumps, one is reminded of the assertion that some of the early Cornish pumps at Pachuca cost their weight in silver to install, as there were no roads to speak of at that period, and all machinery had to be carried or dragged by mules from Vera Cruz, the port of entry. Some of these old Cornish pumps are still doing duty, and other large pumps of the same class have been installed within the last few years.

One notably hopeful feature of this district is the undeniable continuance of vein-enrichment to a moderate depth. The Difficultad and neighboring properties would appear no exception, for rich ore is said to be exposed in the bottom of these mines, at present under water. The Santa Gertrudis must have had some splendid ore in its upper levels, but it is doubtful whether any more valuable deposit, taking both value and width into consideration, has been encountered than is now exposed in their deepest workings. This favorable feature is not likely to continue indefinitely, but there is a large margin of depreciation before the ore becomes too impoverished to work, even at a great depth.

The San Rafael group represents the San Rafael, the Soledad to the west, and the Sorpresa to the east. This vein is one of the strongest in the district and has been remuneratively worked for many years. The present company, San Rafael y Anexas, is credited with 189 dividends, representing—at 40 pesos per month—about 18% interest on market valuation. The Soledad dividends exceed even this respectable figure by some 5%. The output was larger a few years back, when probably the ores were easier won than at present. The depth attained is moderate, and there is every assurance of successful exploitation in the future. This company is also using a modern high-duty electrical centrifugal pump for the unwatering of the mine. In addition, both ore-haulage and water-raising are assisted by a long crosscut driven from near the head of town and cutting the entire vein-system of that part of the district as far as the San Rafael properties. The adit is of respectable dimensions, well constructed and electrically lighted.

The Santa Gertrudis, as before mentioned, has the Amistad and Concordia on the deep of its vein. All are under one management, although run as separate companies; each company having the right to the profits on ore mined within its boundaries, the parent company receiving a percentage of the profit on all ore won on the deep of its vein. Immediately east of the Amistad the vein passes into the Barron claim—formerly a part of the Real del Monte property—and thence passing east enters La Blanca. There are no known developments of value east of the last mentioned. The dividend disbursements of Santa Gertrudis for the past thirty years have been phenomenal. Recently, the management reverted from its long run of Cornish managers to Mexican. Cornishmen have been closely identified with the Pachuca and Real del Monte camps ever since the inception of what might be termed "modern times," and the value of their service in the past it would be hard to overestimate. Pachuca has been the Calumet of Mexico. It would appear from the signs of the times as if others were about to assume "the white man's burden."



A REPRESENTATIVE MINE AT PACHUCA.

The workings on the Amistad property are approaching the 2,000-ft. level, but owing to difficulty with bad

*[Throughout this article Mexican currency is given in terms of pesos and centavos, therefore dollars and cents refer to American money only.—Editor.]

ground and excessive water, development has been slow. The deepest ore exposure is stated to be both wide and of good grade. With the metal in the ore to provide the necessary funds, there are many evident methods of conquering any difficulties that may be presented by either weak ground or abundance of water. There are two large Cornish pumping engines on this property, having 70 and 90-in. cylinders respectively; these combined should be capable of raising over two million gallons of water daily from the present depth. On the deep of the Amistad there is plenty of ground for many years, provided the vein continues remunerative.

La Blanca, as before stated, is on the eastern extension of this same vein, after traversing part of the Barron property. This has been worked for several years with a moderate output, and is today well developed in proportion to its output, which does not exceed 1,000 tons per week; which figure may be taken as about the limit of any Pachuca property of today—referring to the richer ores which are shipped to the smelter for treatment. A new shaft, the San Augustine, is now being sunk—and is down 250 meters—to relieve the pressure on the present main working shaft, the San Jose, and also to render available the upper portions of the mine workings that, at present, it is impossible to use, on account of both lack of ventilation and working facilities. This shaft will probably become available at the end of the present year, when an increased extraction may be expected. There is a large amount of ore that may be fairly considered blocked out between the 275 and 325-m. levels. The vein has been cut and a drift is being advanced on it at the 375-m. level, where the ore is wide and of fair value. As the Barron mine, to the west, is developed three levels below the present stoping ground in La Blanca, there is a considerable amount of ground thus exposed on two sides that may be reasonably reckoned to suffice for six or seven years. Between this part of the property and the southern boundary there are also fair prospects of encountering more ore.

As to the grade of ore and its nature. This vein carries $4 in gold per kilogram of silver. All ore carrying one kilogram silver is shipped to the smelter; below that grade, down to 600 grams, it is treated at local 'haciendas' by amalgamation, employing an improved patio process or some more modern form of pan-amalgamation. Speaking of this vein as a whole, breasts that are stoped for 30 ft. are not uncommon, and in some instances even 50 ft. The grade of ore in these wider parts is fully as rich as in the narrower, and wide stopes carrying three kilograms of silver, with corresponding gold values, are not unknown. The silver is present almost entirely as a sulphide—argentite. Native silver is so rare as to be a curiosity. The chloride of silver is practically unknown, and the arsenic and antimony compounds are negligible. The ore is thus a typical one for the patio, or allied processes, and would appear readily adaptable to cyanidation, since argentite is soluble in cyanide solutions, especially with the use of some accelerator or oxygen equivalent, like mercuric chloride. The grade of the ore, therefore, is the sole factor in determining the choice of treatment, that is, smelting or amalgamation.

One of the marked features underground is the amount of masonry used for the support of levels. 'Laterals' are unusual. The enormous pressure due to a weak hanging wall causes these arches of masonry to collapse, the pressure breaking the solid stone even when double-arched, that is, thirty inches thick. This masonry, seven feet high by six wide, is done under contract for 20 pesos per meter. Masonry is not employed in the stopes, a rude square set being preferred, although it is not dignified by that name; nor, on account of its symmetry of framed members, possessing the same advantages. All sets are close-filled with waste, mostly procured from crosscuts driven for that purpose.

The mills of Pachuca have been referred to. There are none at the mines, the ore being trammed or carted to the several haciendas in the town itself. Most mills employ an improved patio process or some modification of it. At the Progreso there is an installation of the Boss continuous process; at the Union a partial form of barrel chlorination is used. Other mills employ vanners more or less extensively, together with mechanical stirrers in the patio instead of mules to mix the charge. Presumably cyanidation will be tried on a suitable scale in the near future; and with the lower grade ore it will be a matter of some surprise if the introduction has not a marked success.

In most of the mills electrical drivage has been introduced; there are two companies that supply power. The combined output, however, is limited, and will not supply the Pachuca of the future. It is possible that the Mexico Light & Power Company, whose plant at Necaxa is readily available by constructing some thirty kilometers of line, may deem it advisable to enter Pachuca, and, should 10,000 h. p be required in this camp, there will not be the slightest difficulty and but little delay in that company proving equal to the occasion. With the advent of large quantities of cheap power, both the cost of mining and milling should be so lessened as to render a lower grade ore remunerative and prove an added factor in the rejuvenation and increased activity of the district. The Pachuca of the future will depend on deep mining, where hoisting and pumping play no mean part. Electrical energy for both functions is both efficient and cheap.

Tabulated Statement of Leading Pachuca Mines.

Name of Mine	Dividends to Date	Number of shares	Quotation Pesos	Market Value Pesos	Dividends Monthly Pesos	Return %
Amistad y Concordia ..	67	12,800	70	896,000	1	17.1
La Blanca	20	12,500	490	6,125,000	4	9.8
Real del Monte	254	2,554	1,600	4,086,400	10	7.5
San Rafael y Anexas ..	189	1,200	2,600	3,120,000	40	13.4
" " aviados ..	189	1,200	850	1,020,000	12	16.9
Santa Gertrudis	403	60,000	72	4,320,000	1	16.6
" " aviados	82	9,600	14	134,400		
Soledad.....	87	960	1,280	1,228,800	25	23.4

[The aviados correspond nearly to lessees.—Editor.]

The combined value on the open market of the three groups under review is therefore:

La Blanca	6,125,000 pesos
Santa Gertrudis y Anexas	5,359,400 "
San Rafael y Anexas	4,140,000 "
	15,624,400 pesos

Let us compare this valuation with the three leading mines of El Oro district, by way of estimation:

Name of Mine.	Shares.	Quotation—Pesos.	Market value—Pesos.	Dividends per annum—Pesos.	Return—per cent.
El Oro.....	1,080,000	12.50	13,500,000	1.50	12.0
Esperanza.....	455,000	45.00	20,475,000	10.00	22.0
Dos Estrellas...	3,000	10,000.00	30,000,000	720.00	7.2
			63,975,000		

[The peso or Mexican dollar is worth 50 cents U. S.—Editor.]

The three Pachuca mines are, therefore, apparently considered in the eyes of the investor as but equal in value to one quarter of the three mines at El Oro. Just how this valuation is arrived at, it is difficult to see. It is true the Pachuca properties are much older producers than those at El Oro, but, unless developments at El Oro prove ore in depth, those of Pachuca will be working many years after the former are worked out, with the possible exception of the Dos Estrellas, which has a future, and probably can supply sufficient ore for its 230 stamps for ten or twelve years.

The Pachuca mines are controlled by Mexican companies with Mexican shareholders, while the mines of El Oro are held in America, England and France, where a very much lower rate of interest is considered adequate return from a mining investment. The local investor, however, is free to draw his own inferences.

Taking a broad view of the entire Pachuca district and considering the methods in vogue, it must be confessed that one is not a little surprised to find so little real activity over such a wide area. On most of the properties, little or nothing appears to be doing. On those that are at work, the output appears from one-half to one-quarter of what the properties are really capable. The camp as a whole is credited with an annual return of 6,000,000 oz. silver and 30,000 oz. gold, having a total of $4,500,000. The methods employed both underground and at surface are antiquated. Pachuca, with the exception of some electrical drivage, cannot be considered as up-to-date in any way. Its methods are slow and its output small. It resembles a giant in possibilities, but a dismally lethargic one. The Cornish pump, cart haulage, hand breaking, small output, old methods of treatment, steam power, all must go and make room for modern installations and practice.

In the Rainy river district in western Ontario, gold occurs in a mass of rock described in the Government reports of the Province as consisting of a mixture of altered granite, quartz and chlorite, with streaks of green schist. It has been traced three or four miles, and has a general direction of northeast and southwest. The boundaries are rather indefinite, but as near as can be ascertained it is 462 ft. wide at the widest known place. On one location it varies in width from 100 to 200 ft. One hundred feet is its width at the narrowest place, as far as known. It is stated that from careful tests which have been made, much of this rock-matter contains $1.50 per ton in free-milling gold. It has not been found possible, however, to work it at a profit.

Crude Oil vs. Steam.

Written for the Mining and Scientific Press by
William Magenau

Oil and gas internal-combustion engines have found a wide application in regions remote from coalfields or scantily supplied with water, but it will be a surprise to many to learn of the saving over steam-power effected by using crude oil in this type of engine in a locality where the cost of coal is not excessive, and the nearest oil wells 1,000 miles distant.

Such an instance may be found in the custom lead-smelting plant of the Luna Lead Co., at Deming, New Mexico, under my superintendence. This plant has been supplied with power by three Hornsby-Akroyd oil engines of 25-brake horsepower each, made by the De La Vergne Machine Co. of New York. The engine is built to run on kerosene or the higher grades of crude oil, that is, those with paraffin base, as are found at Beaumont, Texas, and in Pennsylvania. The California oil is not suitable, as it contains much bitumen.

To illustrate the saving over a steam-plant, the following tabulation is presented. The basis of equipment is the continuous delivery (24 hours daily) of 40-brake horsepower:

I. COST OF PLANT.

Steam.

Two 11 by 14-in. automatic cut-off steam engines f. o. b. Deming, N. M. (To be run alternately).	$1,161.68
One 48 by 16-ft. return tubular boiler f. o. b. Deming	539.52
Brick and all material for setting	292.30
Concrete foundations for engines and boiler	150.00
Labor of erecting	200.00
	$2,343.50

Crude Oil.

Three 14½ by 17-in. oil engines f. o. b., Deming, N. M. (To be run two at a time).	$4,725.00
One storage tank for oil 13,000-gal. capacity	500.00
Concrete foundations	150.00
Belt of extra engine	50.00
Labor of erecting	100.00
	$5,525.00

II. COST OF OPERATION.

Steam.

Coal Consumption on 1,200 h. p. hr. per 24 hr. (50 i. h. p. to produce 40-brake h. p.) at 5 lb. per h. p. hr. 6,000 lb. at $5 per ton	$15.00
Attendance	
2 engine tenders (12 hr. shift)	8.00
2 boiler-men	3.00
Oil, waste, and supplies other than fuel	0.20
Repairs	0.20
Interest on power plant at 5%	0.30
Cost per 24 hr.	$26.70

Crude Oil.

Crude oil consumption 106 gal. per 24 hr. (actual results) at 2½c. per gal. (in tank car-lots)	$ 2.65
Attendance	
2 engine tenders (12 hr. shift)	8.00
1 helper (1 shift only)	1.50
Oil, waste, and supplies other than fuel	0.20
Repairs	0.60
Interest on power plant at 5%	0.71
Cost per 24 hr.	$13.66

The saving per day of crude oil over steam is $13.04, amounting, in a working year of 350 days, to $4,564, which is $1,400 more than the extra cost of the oil-engine plant.

Cost of oil engine power per brake horsepower per year of 350 day (24 hr. each)	$119.53
Cost of steam power per brake horsepower per year of 350 days (24 hr. each)	233,63

A comparison between steam and oil plants of larger capacity, say, from 100 to 500 h.p. and upward will be less favorable to oil in the chief item of fuel cost, as on such large steam-plants a duty of two or three pounds coal (in this case a good quality of bituminous mined in New Mexico) per horsepower hour could be had. The matter of attendance would be in favor of the large oil-engines. Boiler attendance increases with the size, unless automatic feeds and coal-handling devices are used, and in that case the cost of such appliances and their operation is far more than the cost of handling oil, which is scarcely more for a large plant than a small.

It is not intended here to discuss the matter in all its applications, but merely to give figures from actual experience with small units. It will be noted how closely the actual oil consumption checked the figure found by the engine builders in a 30-minute test-run at their works before the engines were sent out. They reported a consumption of 0.9 lb. Beaumont crude oil per brake horsepower hour, running the engine on full load (25 h.p.). As 0.9 lb. is equivalent to 0.115 gal., and as our plant requires 40 brake h.p., this would figure out to a consumption of 110.4 gal. per 24 hr., whereas the actual daily consumption over several months was 106 gallons.

The engine operates without any accessory carburettors or other appliances for vaporizing the oil, the same being sprayed into the hemispherical head of the cylinder which is kept red hot by the explosions which give the piston its impetus. No trouble is experienced with ignition, as is often the case with electric sparkers or heated tubes on gasoline engines, and the crude oil is completely consumed except for a slight deposit of carbon which clings to the walls of the vaporizer head. The necessity for cleaning this out every 36 or 48 hours (the work of a quarter-hour) requires an extra engine for such service as smelting, where no interruption is permissible; but such extra engine would be installed in any case, as is done in steam-plants to provide against break-downs. In a pinch the plant could run with two oil-engines, allowing 15 minutes each day for partial shut-down in order to clean out one engine.

We had some difficulty with these engines while employing engine tenders not fitted for the work, and I would strongly counsel anyone installing such a plant to employ at least one first-class mechanic versed in oil engines, notwithstanding manufacturers' statements to the effect that a Mexican farm-hand can run them. Since competent men have handled this installation, reliable and cheap power has been the result.

Gold Mining in Egypt.

In a recent Bulletin of the Institution of Mining & Metallurgy, London, Ernest H. S. Sampson describes the ancient mine workings of Atallah in Upper Egypt. He says that the quartz varies in color from pure white through various shades of blue to almost black, and contains galena, pyrite, and blende. The percentage of silver remains fairly constant, notwithstanding the fact that the gold content varies from a few pennyweights up to as much as 14 or 15 oz. to the ton of 2,240 lb. The quantity of base metal visible to the naked eye affords, as a rule, an excellent criterion of the amount of gold in the ore.

Fairly conclusive proofs that the mines were hurriedly abandoned by the ancients, owing probably to an unsettled state of affairs in the government of the country at that period, are to be found in the form of small piles of rich quartz left on the floors of some of the stopes, and also in the fact that some of the working faces had been left absolutely untouched after the fire-setting was actually completed. There is abundant evidence that fire-setting was the chief method employed for the disintegration of the quartz. The hanging, and sometimes the foot-wall, of the veins is in most places blackened by the smoke from the brush-wood fires, and charcoal may be found in considerable quantities in many instances where the workings have not been filled with sand and rubble. The only tools so far discovered are two almost perfect specimens of iron picks (very similar in design to the modern miner's pick) and, probably more ancient than these, a stone implement in the nature of an ax-head, identical in shape with a specimen that was found near Kimberley in the early days of the diamond-fields. Numerous stone hammers also were found; these may or may not have been contemporaneous with the iron tools above mentioned. Two classes of stone grinding mills were also found in considerable numbers, while at the Eridea mine a few months ago, a wooden scraper was discovered, shaped something after the fashion of a Dutch hoe, the blade being about 10 in. long by 4 in. wide, and semicircular in shape, and the handle two feet long. In the old workings at Atallah some wooden props were found, evidently placed in position with the intention of supporting the roof. The wood was a hard variety of acacia similar to that growing in the wadies at the present day, and was still in a perfect state of preservation, notwithstanding the fact that it had probably done duty for 2,000 years. In the same stope were also some stone supports arranged after the manner of the monoliths at Stonehenge, that is, two upright slabs supporting what is technically called a cap or head-tree.

An Authoritative Opinion.

By John C. Branner.

During the past week Mr. John C. Branner, professor of geology in Stanford University, delivered an address at San Jose. Among other things, he said:

Ever since I have been in California I have been making a study of the geology of the Santa Cruz range of mountains. The work of mapping out the fault which lies along its surface was completed about six weeks ago. Immediately after the earthquake I went out to see if these fault lines had been doing any business. I found, as I expected, that they had.

Where we had located the line on the map was a great furrow, marking the line of the disturbance. Roads were pushed out of their places, pipes were broken fences were disarranged, and the surface of the earth was broken up on the summit of the range along the full extent of the fault line, and all of the manifestations of a violent character were within a very short distance of the line.

This fault begins a short distance south of San Francisco. That city is not along the line of the fracture, as it enters the ocean near Mussel Rock. From there it runs over the mountain, through San Andreas lake, through Crystal Springs lake, through the village of Woodside, over Black mountain, along Stevens Creek canyon, across Campbell creek two miles above Saratoga, through Wright's station and Skyland. Along this course we traced the disturbance and it was marked in a perfectly distinct way.

It showed a lateral displacement of at least eight and a half feet. There was no vertical displacement. Of this movement there were evidences in great abundance. Near the coast a road is broken and thrown out several feet. At Woodside a six-foot displacement was noted. A water pipe was broken in two and the ends are seventy-three inches apart. A fence has been offset eight feet. At another point a fence was jammed together the length of a panel. Some water pipes were found which were telescoped. Near Woodside the fault ran under a big oak tree, which was uprooted. In Stevens Creek canyon were landslides without number. Near Skyland a house was broken in two.

The greatest effect of the slipping of the fault was noticed in the trees. The houses did not seem to be much more badly damaged there than they are in the valley; but limbs of trees were snapped off. Trees were uprooted. On the other side of Loma Prieta, along the line of the fault, the forest looked as though a swath had been cut through it two hundred feet in width.

At Black mountain I found beside the main fault, which ran through the mountain, a sort of branch. Following this the whole side of the mountain seemed to be shattered as though it had been picked up and allowed to drop. In a little over a mile I counted no less than 345 cracks running in every conceivable direction.

I am sure that the slippage of the fracture was at least eight or nine feet. The fault was an old one. All the large surface stones had been previously broken up. The soil was deep and was not in a condition to show the full extent of the movement.

Although I have not made a personal examination of the territory north of San Francisco, I am sure the same fault extends to that region. After leaving the coast it follows the bed of the ocean to Bolinas bay, to Tomales bay, then to Fort Ross, over the hill to the bed of the Wallala river and the Garcia river, thence to a point near Manchester, where it enters the ocean again. This is undoubtedly responsible for the great disturbance in that region.

Some people are surprised that there was no tidal wave overwhelming Santa Cruz. Many expected to see one coming up the Santa Clara valley from San Francisco bay. The explanation of this is simple. The movement was lateral and could not cause a wave. If a vertical movement of the same extent had come there would certainly have been a wave of probably considerable size. There need be no fear, however, that San Jose will ever be overwhelmed by one. The configuration of the bay is such that it could not get here; at least until the people had time to get safely out of its way.

As to the cause of the pressure which produced this slipping there are three theories. I will give them to you and let you take your choice. The first is that the increase of temperature in the earth, gradually coming toward the surface, has caused an expansion of the rock and a consequent pressure outward. The second is that rocks which were hot have become cooler and contracted, producing a strain in the other direction. The third is that the shifting of the load on top of the earth produces the pressure.

It is as though Mt. Hamilton were transferred to the Santa Cruz mountains. The shifting is not accomplished in this way, of course, but it is continually going on by the streams carrying sand and mud from one section to another.

The question is sometimes asked seriously whether the weather has anything to do with causing earthquakes. The question has been given serious consideration. Scientists have made lists of all earthquakes that have been known, have tabulated them, have noted the phases of the moon, have taken into consideration the weather condition. Their conclusion is that if there is an earthquake just ready to go off, a change in barometric pressure may start it. But it is not possible to conceive of an earthquake being created by weather of any sort.

It was expected when I was invited here, of course, that I would soothe your troubled spirits and explain away all possibility of a repetition of the shock of a month ago. Well, I shall leave prophecy to the prophets. That is not in my line. I cannot tell whether there will be another earthquake or not.

My confidence, however, is based on this fact. The rocks forming the crust of the earth on the coast have been broken up so by the past disturbances that no great strain can accumulate. The faults slip more easily than if they were two masses of solid stone pressing against each other. Our hope is that the little earthquakes may continue. They relieve the strain, and do not give an opportunity for any great pressure to develop.

So far as this matter is concerned, however, there is no part of the world that has any assurance that it will be free from temblors. Missouri had a very severe earthquake a great many years ago, and yet if scientists had been asked to pick out a section that would probably be free from earthquakes, that would likely have been the spot they would have settled on. So much for prophecy. I feel safe in saying, though, that California will probably never experience any violently destructive shock, and for the reason I have mentioned. So far as California is concerned, I would rather live here with its earthquakes than anywhere else without.

Cheap Mining.—Mine superintendents sometimes receive more credit for cheap mining than they are really entitled to. In one instance a new superintendent finds the property without ore, but with a large amount of deadwork done. He continues the work a short time and develops payable ore. This at once distinguishes him as a capable miner and good manager. In another instance the superintendent develops a good orebody, discontinues development work, thus cutting down expenses, while producing good results at minimum cost. He goes to another locality and leaves an exhausted mine for his successor, who must find more ore, if he can, at the expense of profits previously made. The owners, if not practical people, naturally make a comparison between these men to the disadvantage of the new man. They tolerate him, possibly until the expiration of the term of his contract, during which time he has vigorously carried on deadwork. They then offer extraordinary inducements to the former superintendent to return, which he does, and finds the mine in such a condition that it proves no hardship to place it quickly on a paying basis once more—at the expense of the reputation of the man whom he has just succeeded. A superintendent may gouge a mine taking out ore at low cost and apparently leaving a large amount of ore in sight but he may have carried on his work in such a way that this ore can only be reached at great expense, or it cannot be mined at all at a profit by reason of the previous application of improper mining methods. The cheapest mining is that which permits the extraction of the ore at a minimum of expense, and at the same time makes available an amount equal, at least, to that removed, until the mine is exhausted. Makeshift, and short-sighted methods, which take no heed of the morrow, cannot in the end give the most satisfactory results.

Korea.—The mineral output of Korea is principally gold, recovered both by placer and quartz mining, with over 120 workings, and an annual production of about $2,250,000. Placer gold represents 66 per cent of the total. There are silver deposits but only experimental workings have been made. Copper is found mostly in the northern and southern portions of the peninsula. The Kapsan mine is producing some 270,000 pounds of refined copper per annum. Iron is found in several provinces but the expenses of mining and smelting have retarded the exploitation. There are some coal deposits at Pyeng-Yang consisting of smokeless coal, and the others of rather inferior bituminous. Excellent crystal is found in north Kyeng-Seng, and is a famous product of Korea.

Gold Veins in Granite in California.

Written for the MINING AND SCIENTIFIC PRESS by
W. H. STORMS

The gold-bearing veins occurring in granite in California have distinct characteristics, and are in many respects unlike the veins found in stratified rocks, though resembling, somewhat, those occurring in other massive rocks.

The largest areas of granite in this State are those in the Sierra Nevada, but there are other granitic exposures in the Coast range, and in the desert country south of the Tehachapi mountains. Whenever veins are found in these granitic rocks, they possess many structural features in common, and to such an extent are these peculiar conditions similar that it may be concluded that they are due to the fact of their occurrence in a rock of almost identical character, whether in the Sierra, or in an isolated desert mountain.

In these several granitic areas are found a large number of veins. Some of them appear to be entirely independent of all others, though in many instances there are found systems of connected fissures, produced by the same cause and having many things in common. It has been remarked that the minerals occurring in these veins in granite are similar throughout the State, and it has been further observed that they differ materially in this respect from the veins found in the andesites, diorites, quartz-porphyries and other massive rocks, whether these rocks occur in the vicinity of the granites or at a great distance from them.

In some instances veins pass from granite into greenstone or slaty rocks. Wherever this occurs, there is a distinct difference between the veins, not only in their structural features, but in the ore.

There is no uniformity in the strike and dip of veins in the granite. They strike in various directions, even in the same district and in the same vicinity. In several districts there occurs a main fissure, usually large and well-defined and of relatively great continuity, from which branching veins extend outward at an angle of 30 to 45°, sometimes on one side, more often on both sides of the main fissure. Occasionally these branching veins cross the main fissure, but as often their continuity is interrupted by it, though, at some distance from the point of intersection, a vein will be found branching from the opposite side of the principal fissure.

In some instances it might be thought that the cross-fissures were the older and had been cut by the larger fissure, with a displacement by faulting along the plane of the more recent vein. The structural condition of the veins at the point of branching, however, does not bear out this theory in any instance which has come under my notice.

The dip of these veins is no more regular than their strike. In the veins occurring in slaty and schistose rocks, the strike and dip usually conform with those of the inclosing rocks, or nearly so, and in the foothill region of the Sierra Nevada, this strike is almost uniformly a few degrees west of north, with a dip to the eastward, varying from 30 to 90°, but usually between 45 and 65°. The veins in granite strike indiscriminately in any direction, dipping in the same erratic manner, and frequently changing dip, rendering economical development a puzzling problem to the mine manager, who, to avoid losing his vein, usually follows it wherever it may lead him until he has measured the inconstancies of dip and determined where it will be most advantageous to sink a new shaft at a uniform angle. It is nothing uncommon for a vein in granite to dip in quite another direction in depth from that near the surface, and in some instances these changes of dip are numerous. These fissures are found occurring singly and in pairs, and in many places, as zones of fracture of varying width, comprising several fissures having an approximate parallelism. Not infrequently these fissures, both those occurring singly and those of multiple fracture, are planes of movement. This is evidenced by the striations on the walls, and by the polished surfaces, gouge and seams of clay. In many cases these zones of fracture are found to consist of crushed granitic material, much altered, and in some instances containing vein-quartz in a granulated condition, indicating that the movement of the rock-masses had again occurred or continued long after the original deposition of the silica in the zone of fracture and crushing. The occurrence of polished faces on planes within the vein itself is another evidence of this. In more rare cases, veins have been fractured by movement of the walls and silica, infiltrating, has recemented the angular fragments, forming a brecciated vein. It is strange, however, that only rarely are veins of this type payable. They usually contain gold and sulphides, but not enough to constitute a profitable mining proposition.

In the zones of crushing, the feldspars are invariably kaolinized, and the bi-silicates are altered to chlorite and other secondary products. The whole mass is soft, and when wet, often mushy, and dangerous to mine, requiring prompt and close support. This soft, decomposed, granitic mass usually contains iron sulphide and gold, but is generally too low-grade to constitute profitable ore.

In these same fissure-planes or zones are found the concentrated mineral deposits commonly called 'ore-shoots.' In extent they vary greatly, from short bodies less than a rod in length to those several hundred feet long. Where small shoots occur it is not uncommon to find them succeeding each other at short distances, forming practically a continuous run of ore two hundred to three hundred feet long, or even much longer.

The ore-shoots usually lie to one side of the crushed zone; sometimes there is soft material on both sides of it. In other instances the pay mineral is separated from the zone of fracture and alteration by a strip of hard granite, indicating the periods of mineralization, only one of which resulted in the formation of ore. Occasionally the ore-shoots are distinctly separate, succeeding each other at greater or less distances, and connected by nothing more definite than a clay seam of knife-blade thinness. Large masses of quartz occur, ten to twenty feet wide, white, partly crystallized and showing beautiful structure, with clean walls, but almost destitute of gold or silver minerals, and but little sulphide, and that low grade. In some instances, a large quartz vein of this description will be found accompanied by a small pay-streak of rich pyrite, but more commonly the richer ore is found in separate shoots, filling the fissure in which it occurs, from wall to wall, and not infrequently the richest ore is found in veins branching out from the larger vein, as above described. There are several instances of this character in Tuolumne county, near Soulsbyville and Carters.

That these veins are the result of the substitution of silica, calcite, and other minerals for the more soluble portions of the crushed granitic mass there seems no reason to doubt. These vein minerals have been conveyed to their point of deposition by mineral solutions, probably issuing from a deep-seated source. The most complete replacement has taken place where the fissuring and crushing of the original granite has been complete. The vein quartz is found exhibiting every phase of condition from a partial alteration of the granitic minerals to a complete substitution of silica, calcite, pyrite, pyrrhotite, and other sulphides, for the altered granitic mass. Even rock that is almost normal granite in appearance, will carry payable gold and auriferous sulphides. This will occur both within the vein and in the wall-rock adjacent to the fissure, proving that the mineral solutions which deposited the sulphides and precious metals in the vein were not confined wholly within the limits of the fissure, but also penetrated the adjoining rock to a distance of a foot or more. It will be understood that where these minerals occur in hard, apparently normal granite, close inspection of such gold-bearing rock will show it to be altered. The quartz grains may appear normal, and doubtless are, but the feldspars will be found white and opaque; finely disseminated pyrite is always present, and in many instances galena will also be present. The appearance of galena, though not without exception, is generally an indication of gold, whether within the vein or in the wall-rock.

In the silicification of these zones of crushed granite every phase of alteration is noticeable, from that wherein the presence of foreign quartz is scarcely observable, through every stage of transition, to the most complete alteration to crystalline quartz. Calcite is of common occurrence, and quartz crystals are frequently found.

A characteristic occurrence in these veins is that of a brilliant iron sulphide appearing in groups of fine crystal aggregates, often tarnished and iridescent, forming beautiful cabinet specimens. So characteristic are these occurrences that it is often difficult to distinguish ores of this kind in one granite district from those of similar kind in another district many miles distant, and possibly in another granitic area. Pyrrhotite is another characteristic mineral. Mispickel, galena, zinc-blende, chalcopyrite, pyrite are abundant and occasionally telluride minerals are seen. In some localities the vein quartz is normally fine-grained and flint-like, but it is often found crushed to a sugar-like condition, as white as snow and containing little if any sulphide mineral. The flinty, hard masses, occurring as a nucleus of the white granulated rock, sometimes show faint bluish stains and, more rarely, the minute dark flakes of a telluride mineral. Such rock not infrequently also shows free gold, and assays well; but owing to its limited occurrence it is likely to prove disappointing. Of the many varieties and conditions of ore found in these veins in granite the most satisfactory is the heavy sulphide ore, generally containing twenty to sixty per cent sulphides and assaying from $20 to over $100 per ton. In some mines, ore of this character runs from $200 to $500 per ton. When concentrated, the sulphides are usually high grade, occasionally running up to $1000 per ton. Some of the mispickel ores are rich and in a few instances the zinc-blende is found to carry large amounts of silver or gold, and usually both. Again, the quartz ore—in granite—containing pyrite only is high grade, as compared with the ores of the slate and greenstone belts.

Although the veins vary greatly as to width, there is nothing approaching a constant ratio between size and value. The wide vein may be rich and the narrow vein poor, and vice versa, but ordinarily the smaller veins are the richest. Nor can the physical appearance of the ore always be depended upon as an index of value, for the pieces broken in different mines may look much alike, but differ greatly in value. Pyrrhotite and mispickel are the most characteristic minerals of veins in the granitic areas, the former being particularly abundant in the larger orebodies, and the latter in the smaller veins.

Ore-shoots often overlap at their ends, being apparently in a chain of fissures following a general direction, and connected by small crossing seams or fissures, though these latter are obscure. Occasionally two veins may be seen approximately parallel, but separated by a strip of much-altered granite, one to four feet wide. In both strike and dip these veins will, in some instances, be found to unite, forming a single vein, only to part again further on and possibly to send other off-shoots, or branches, into the walls. This condition would suggest the formation of a system of intimately connected fissures, produced at the same time and by the same cause. This branching tendency is one of the most pronounced characteristics of the veins in granite in California.

Usually one wall is better defined than the other, generally the foot-wall, the zone of fracture extending into the hanging-wall granite, to varying distances. Sometimes the line of demarkation between vein and wall is sharp and clearly defined, though there may be no gouge, selvage or seam between the two rock-masses; each presents its own peculiar physical characteristics; the vein being, in the phraseology of the miner, 'frozen.' In other cases a clean well-marked hanging wall may be seen which gradually diverges from the foot, the vein practically filling the zone from wall to wall. Where the space between these walls is narrowest, the vein is likely to consist of solid well-mineralized quartz, but as the distance between the walls increases, the vein material gradually takes on the granulated appearance of the granite; mineralized portions of the altered granite itself may be found, though there may be masses and reticulations of solid sulphide ore mixed with this otherwise unpromising material. When the grade of the best ore is high, this granitic vein-filling is also likely to be payable.

When the two walls have diverged four to six feet, another interior slip is found forming a second hanging wall a foot or less from the foot-wall, which diverges in the same manner as before, and this in turn is succeeded by a third, and so on throughout the length of what may be considered the pay-shoot, which in this instance is made up of a succession of irregular wedge-shaped orebodies.

Large veins, well defined, and mineralized will gradually become smaller, finally pinching out and disappearing in a few small seams that are lost in the country rock. When this occurs, if the mine workings are driven straight ahead, another lens or orebody is likely to be encountered, or, if not appearing in the drift, judicious cross-cutting will usually discover it, offset to one side. If to the left, the next shoot is also likely to be to the left. The characteristics described as occurring longitudinally in these veins, may to a great extent be anticipated in following the vein on its downward course also.

At many of the mines occurring in granite it is the custom to sort out what is considered waste from the recognized ore. Where the payable ore is clean quartz with or without sulphide mineral, this may be done to advantage, but when the quartz ore becomes much mixed with the partly altered granite, sorting cannot be practiced so effectively, and instances are known where the richest ore was the decomposed granite, the quartz containing more mineral but less free gold. It is not an uncommon thing to see coarse gold in the granite of the vein proper and also in the walls at a distance of a foot or more from the walls. This must be watched closely by the miner or rich ore will go to the dump. The fact that several old granitic dumps at California mines have been profitably sorted and milled is sufficient proof that such care was not always observed.

The Evolution of a Mineral Vein.

Written for the MINING AND SCIENTIFIC PRESS by ARTHUR LAKES.

It has been suggested recently, by D. W. Brunton, that in large mines a mining geologist should be employed whose business should be to keep track of the development by making maps and sections of the geological features of the vein as they are brought to light by exploration. Being engaged for some weeks at a small mine in Idaho, I endeavored to carry out this suggestion when observing the behavior of a vein in the face of the drifts, winzes, and raises, as exposed after each shift, and making drawings of them when there was any notable change. Sketching the vein constantly and recording the date of each sketch with the distance from one observation to another, appeared to throw some light on the essential character of the vein formation.

Many so-called veins are mineralized zones rather than individual veins; in this case, the zone lay in a series of thin layers of contorted limestone, with some slaty and quartzitic beds. The bodies of ore and vein-matter occurred in lenticular form, alternately widening and pinching. When the lateral crumpling formed a concave or hollow fold, the vein-matter was liable to occur in its lap, and when, by the same force, the strata bulged ,there was a corresponding pinch.

The vein-matter and ore were within a zone of slip-planes, due to compressive forces corrugating the strata and causing the pliable sheets of rock to slide over one another like the leaves of an unbound book when crushed in the hand. Each sheet of rock, as it slid past its neighbor, polished, grooved, or striated it, and was correspondingly polished and striated in turn. Striation lines showed the general direction of the forces exerted and the movement of the strata, which might be even in opposite directions. In a neighboring mine two sets of striation lines were found crossing one another diagonally on the same hand-specimen surface is coated by graphite, shining like a polished steel plate and crossed by both straight and contorted grooves, and striation lines. Fig. 1 gives a general idea of the vein-zone. A represents the hanging wall of thinly bedded black limestone, which is sheeted by slip-planes. B is a lenticular body of breccia four to six inches thick and, like that of Fig. 4, cemented by graphitic matter and impregnated with iron pyrite. some galena and some zinc-blende, yielding at times a fair body of ore. C is an adjoining zone, a few inches wide, of a soft, oxidized character and reddish, banded appearance, containing thin seams of crystalline quartz and some galena. The ore may be a replacement of the crushed rock. Its banded structure suggests infiltration of mineral solutions. D is a zone, two to three feet wide, of brecciated silicious limestone. This is followed by E, a persistent belt of black, slaty matter, barren of ore, and giving no reactions with acid, locally

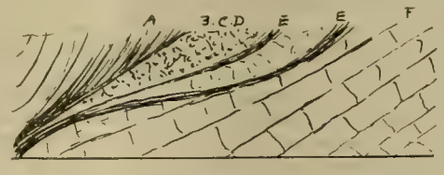


FIG. 3.

called the "foot-wall band," which in subsequent developments grew nearer and nearer to the hanging-wall zone until it split up and merged in it. Fig. 2 shows the beginning of a fault in the foot-wall band, which was acentuated a few feet further. Such faulting and disturbance generally presaged ore. With the final merging of the foot-wall band with the hanging-wall zone, and an accompanying flattening in dip, there came an increase of quartz, ore and vein-matter, and a union in the vein which led, shortly after the condition represented in Fig. 3, to the discovery of a lens three

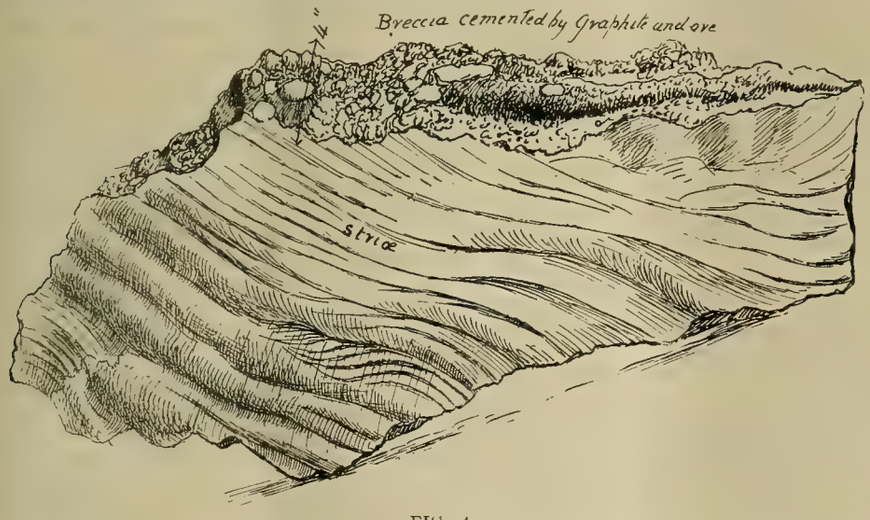


FIG. 4.

of polished mineral, showing that beside the original movements that made the fissures, there were later ones disturbing the ore by forces exerted at different times and in opposite directions. A gouge, black with graphite or other carbonaceous matter, coated the surface of the slip-planes, and the lenticular space between them was occupied by crushed fragments of wall-rock cemented by gouge, quartz and ore. Ore was likely to be found when buckling was most pronounced and when the strata were most disturbed, as evidenced by crushed rock and the appearance of little faults, also when the dip flattened and when quartz and black graphitic matter were abundant. The principal zone for ore was near the hanging wall, where these conditions most prevailed. In the movement of the strata, two or three curved slip-planes, inclosing narrow lenses of vein-matter, might overlap one another. Next to the hanging-wall zone there was a body of breccia, two or three feet wide, followed by a belt, called by the miners the "foot-wall black band," because it lay next to the so-called foot-wall and was composed of a light gray silicious limestone, as compared to the dark limestone of the hanging.

In the accompanying sketches, Fig. 4 shows the section of a lens taken out bodily between two slip-planes close to the hanging wall. The ore and breccia are cemented by a black filling. The lens is about four inches in greatest diameter, tapering each way; its feet wide and ten feet long of solid galena. This pocket was, however, quickly followed by a corresponding pinch.

To Determine Arsenic in Presence of Vanadium and Molybdenum.—To every one gram of the substance are added 1½ gm. of potassium iodide and 70 c.c. of hydrochloric acid (sp. gr. 1.16) and the mixture is distilled at once, without waiting for solution. A 100 c.c. distillation flask with a well-fitting ground-in delivery tube is employed, and in order to avoid liquid being thrown over, the neck of the flask is enlarged at two points. The receiver is cooled by water to prevent loss of arsenic. Much iodine separates at first and until all this is over, the flame should be carefully regulated to prevent stoppage of the delivery tube. All the arsenic is distilled over in 20 min. The distillate is evaporated to a syrup, chlorine water being added at intervals as an oxidizer. The arsenic pentoxide may then be weighed as such, over phosphorus pentoxide, after evaporation in a platinum dish and heating to dull redness (435° to 450°), or be precipitated by magnesia mixture. The vanadium and molybdenum in the residue are separated, as usual, by sulphureted hydrogen, the former being determined and volumetrically by permanganate and the latter as trioxide, according to the known methods.—Journal of the Society of Chemical Industry.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each quest on. No assays are made.

The three samples from Contact, Nevada, marked W. F. K., are all consolidated volcanic ash, commonly known as tuff.

The rock from Wolton, Wyo., is a basic eruptive rock —Norite. It belongs to that class of intrusives described by J. D. Irving as 'luster-mottled rocks,' occurring in the Lake Superior region.

The rock from Boise, Idaho, marked Snake River plains, is Calcareous Travertine,—calcium carbonate deposited from springs. Rock of this character makes superior lime, and when mixed with the proper amount of clean clay makes excellent hydraulic cement.

The mineral from Columbia, Arizona, marked C. W. N., is principally Cerussite (lead carbonate). The brown portion is principally iron oxide, and the light green spots contain a little copper carbonate.

The mineral sample from Robinson, Utah, is a hydro-carbon, and may be considered as one of the varieties of Elaterite, which it most resembles. Gilsonite is hard, brittle and looks much like pitch. Grahamite resembles Gilsonite. 'The Prospector' makes no analyses.

The rocks from Coarse Gold, Cal., are: No. 1, Quartz, in which is enclosed Garnet, and a little Epidote (the greenish portion; No. 2, Limonite (iron oxide). It may be the gossan of a vein, though this cannot always

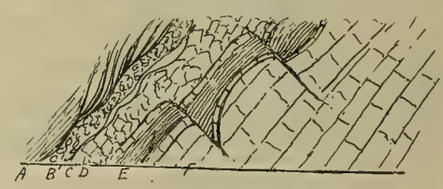


FIG. 2.

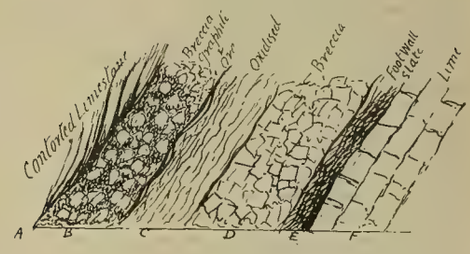


FIG. 1.

be told positively from the hand specimen, for ferruginous springs frequently deposit iron oxide which in time may become consolidated into a hard ore. Bog iron ore deposited in lake beds also is similar in appearance.

The New Standard Concentrator.—Concentration of ores is one of the most important of metallurgical operations, for upon the successful application of concentration often depends the success of the mine, and the machine which can accomplish this is in demand. The latest mechanical device introduced for the purpose of mechanical concentration of ore is the New Standard concentrator. This machine is larger than most table concentrators, and is claimed by the manufacturers to be therefore superior to machines of less superficial area. It combines the well-known, and successfully long-applied, bumping-table principle, with the low riffles, adjustable grade, and cross flow of water, that are important features of some other concentrating machines.. The New Standard is hung from a substantial timber frame, therein differing from most other machines which are supported by uprights from below. The makers claim for it, large capacity and clean concentrate—desirable features in every concentrating machine. It is manufactured by the New Standard Concentrator Company, 602 North Main St., Los Angeles.

Special Correspondence.

LONDON, May 9.

At the annual meeting of the Great Boulder Proprietary Gold Mines, Ltd., held last week, the chairman, Mr. G. P. Doolette, had a highly satisfactory report to give. In the course of his speech he pointed out that although the annual returns for 1905 are somewhat less than they were in 1904, the extensive developments more than counterbalance the shortage which is shown in the returns, and never in its history had the Company been able to record such material prosperity. The developments for the year added 206,535 tons, containing 172,523 oz. gold, to the reserves, which, after deducting the ore milled for the year, namely, 132,052 tons, show an actual increase of over 75,000 tons, the total reserves at the end of the year being 453,649 tons, containing 456,379 oz. fine gold, having a money value of £1,893,800, thus, the chairman remarked, establishing the Great Boulder Proprietary company's shares as a gilt-edged security amongst mining investments. The output for 11 years has been nearly 4½ millions sterling, and nearly half of this amount has been distributed to the shareholders by way of dividends. During 1905 they had a large capital expenditure of over £50,000, which came out of revenue without interfering with the regular dividends, the benefit of which the shareholders were having at present, and will have as time goes on. One of the satisfactory features in connection with the development was that the average value of the ore is well maintained (being 1.12 oz.), and that the return from the ore treated is kept well within this value. It was an accident that the returns for 1905 are somewhat lower than those of 1904, and consequently that the profit had not been so great; but all the same it was satisfactory that on the year's working the handsome profit of £320,258 had been made, which not only enabled them to maintain the regular quarterly dividends, and to provide for the capital expenditure in the equipment of the Hamilton shaft, and the addition of accessories to the mill for the reduction of costs, but also to pass to the reserve fund the sum of £35,000, bringing that fund up to £160,000. Referring to the working expenses, the chairman said: Another satisfactory feature of the work for the year had been the appreciable reduction in costs that had taken place. Three years ago the costs per ton of ore amounted to 37s. 8d., and today, including developments, they had been reduced to 24s. 9d. per short ton of 2,000 pounds.

At the recent general meeting of the Kalgoorlie Electric Tramways, Ltd., hopeful views were expressed as to the future of the district. Mr. Allen H. P. Stoneham, who presided, referred to the question of the permanency of the towns of Kalgoorlie and Boulder. He said he personally still had a great belief in the permanency of Kalgoorlie. Some people had an idea that the mines will cease producing and that the town of Kalgoorlie will disappear in the bush from which it sprung, but he was perfectly sure that this will not be the case in our time. There is enough gold in the Kalgoorlie mines to keep them working for very many more years to come. The people of Kalgoorlie are continually erecting permanent buildings, laying out public gardens and parks, and making various extensions and improvements. The chairman always found the Australians a shrewd people, and he did not believe for a moment that they would put their money into permanent improvements unless they were convinced that the town was going to last. Mr. Octavius Beale, until recently president of the Association of Manufacturers of Australia, followed in the same sanguine vein. He said he had visited the mines at Kalgoorlie and had tried to form his own judgment as to their permanency. Many of them were being worked up to their boundaries, and no extensive work was going on outside. He asked Mr. Loring, of the firm of Bewick, Moreing and Co., "What do you think there is beyond the boundaries?" He replied that there was not the slightest doubt that they would find gold there, as they had done in the parts already being worked. It was everywhere believed that there was no possibility of the exhaustion of gold in Western Australia. Vast deposits had been found, and there was no doubt that other deposits would be found in the future.

Cabled advice has been received from the head office of the Mount Lyell Mining and Railway Company, in Melbourne, to the following effect: Ore treated during half year ended March 31: Mount Lyell mine, 144,780 tons; North Mount Lyell mine 57,740 tons; total 202,520 tons, averaging 2.41 per cent copper, 1.84 oz. silver, and 0.059 oz. gold; metal-bearing fluxes, 11,710 tons; purchased ore, 586 tons. Operations have resulted in a net profit of £255,648, inclusive of profits from superphosphate business (or £67,070 in excess of previous six months); this is after allowing for dividend and income taxes, £6,000, depreciation £8,713, and mining exploration not charged to mine preparatory works overburden account, £13,057. Credit balance to profit and loss account, £414,289. Liquid assets in excess of liabilities, £514,240, including stock on hand, but excluding outstanding debentures, £76,720. Cost of producing blister copper is 13s. 7.05d. per ton of ore. In terms of last half-yearly report, £25,000 has been placed to reserve fund, making £50,000, and the directors will place to reserve fund further £25,000, also £3,300 to insurance fund, making amount to credit of this fund £10,000. Dividend of 1s. 3d. per share, with a bonus of 1s. 3d. per share (amounting to £150,000), has been declared, payable June 15. Chemical works: Total output of superphosphates sold readily, owing to high-grade. Demand greater than the capacity of the works. In view of this and increased demand, entire plant being duplicated. Ore reserves: General manager reports, although no exact figures can be given, it would appear from all indications that tonnage extracted above 700-ft. level during the period has about been balanced by new accessions, and probable reserves below 700-ft. level are largely in excess of those assumed at commencement of half-year.

In an editorial on the Stock Exchange account now in course of adjustment the 'Financial News' remarks that "the variations in mining shares have been mainly in the downward direction. The past fortnight has not been propitious. A holiday break is never good for a bad market. The hardening tendency of money and the obscure outlook in Natal have told their tale. The Budget speech disclosed no indication that the Chancellor of the Exchequer understands that the restoration of public credit depends more on a steady stream of gold from the mines than on £500,000 set aside out of revenue for debt redemption. The wording of the proclamation inviting Chinese coolies on the Rand to become candidates for a free sea-trip at the Imperial expense gave a tardy hint that the Cabinet shrinks from dealing a too deadly blow at the source of the gold this country wants so badly, and at the one industry on which South African prosperity is based."

One of the few bright spots in an otherwise cheerless account has been Dolcoath, the shares of which rose from 18s. to 24½s. during the fortnight.

All those interested in Mexican mining (and the number is rapidly increasing) will learn with satisfaction that one of the miscreants who held up the Dolores bullion train in February last, has been captured, after a desperate struggle against five men, in the little Mormon settlement of Colonia Morelos, in Sonora. From an account which has been published it appears that Norcross and John Wright, one of his companions in the hold-up, were urging their fleet horses toward the border, after weeks of roaming through the mountains since the crime was committed. Supplies fell short. Norcross offered to go to the Mormon store to buy crackers and cheese. Rurales, the best mounted officers of the Mexican Republic, were on their trail. Suspecting the plans of the bandits, the rurales made a detour, and warned the Mormons. Norcross entered the store and faced the leveled barrel of a rifle held by a Mormon storekeeper. His own gun and horse were at a distance, and he could not reach his six-shooter. Seizing the barrel of the gun, he exerted his giant strength to the utmost. He is young and vigorously built. Struggling with the storekeeper, he made his way to the door, but the rurales, heavily armed, appeared. Norcross dashed for a corner of the store to draw a revolver and fire from shelter, but was shot from behind, the ball passing clean through him, breaking the thigh bone. Norcross was taken across country to Casas Grandes, then to Juarez, across the line from El Paso. There his wound, in horrible condition, was dressed by a surgeon for the first time. Norcross bore it stoically. A judge came to his cell and began his examination. Two days it continued. Norcross omitted no details, giving the names of his companions in the attack. The list included the notorious Billy Stiles, who has a long record as a bad man in the Southwest; the two Musgrove brothers, whose lawless deeds in Arizona form a lurid part in that Territory's crime record; John Wright and two others of less fame. All were Americans. After the search of the train had revealed the fact that the animal with the treasure had escaped, the bandits took flight, separating into several parties, thinking that not more than one detachment at most would be captured. The Musgroves and Stiles dared not make for the border, as they are wanted to answer for many crimes in the United States. Wright escaped after Norcross was captured, and is believed to be near Lordsburg, New Mexico. The others are still in the mountains, and the rurales are pushing the hunt. It has since transpired that Norcross died from his wounds.

The Dolores directors have marked their appreciation of William F. Smith's fidelity and pluck by presenting him with a Tiffany gold watch having a suitable inscription, also with a substantial sum in cash, accompanied by a copy of the resolutions of the board, recording the event.

To the many expressions of keen sympathy with the editor and staff of the 'Mining and Scientific Press,' evoked by the terrible calamity of earthquake and fire, your numerous subscribers and readers on this side now add their congratulations on the spirit and resource evinced by the announcement of the editor and business manager which has just reached London.

TORONTO, May 18.

The Cobalt mining boom has given a great impetus to speculation in mining shares and real estate. The multiplication of companies shows no sign of cessation, several new ones being launched every week, many of them with capitalizations running into the millions. A few of these represent actually producing mines, but the great majority are based on nothing more tangible than claims and indications. However, the public is not as yet in a critical mood; anything bearing the magical name of Cobalt and making a plausible showing on paper has an attraction for the small investor. With the object of giving some measure of protection to the public, a law has been enacted by the Ontario legislature requiring prospectuses of every company selling shares or debentures in the Province to be filed in the Provincial Secretary's department and copies must also be given to everyone buying shares or debentures. The advance of real estate prices in Cobalt and the neighboring towns is also of a highly speculative character, especially in view of the northward extension of the mining area, and the pushing forward of railway construction through the mineral-producing region, which may reduce the Cobalt area proper to merely the southerly fringe of the mineral belt. Nevertheless real estate is soaring in Cobalt. The Cobalt Standard Mining Exchange have just paid $15,000 cash for a lot of 70 ft. frontage, or at the rate of $215 per foot, and are putting up a modern $20,000 building, which is to be completed by the end of the present month. Applications have been made for office-room by brokers representing Toronto, New York, Detroit and other firms, so that the local stock market will be kept in close touch with the financial world.

The starting point for the numerous prospectors who are going up the Montreal river in search of gold, is the small village of Latchford, some eight miles south of Cobalt. A party of railroad men just returned to Latchford from an up-river trip into unsurveyed territory, report having struck it rich, having found a 12-in. quartz vein carrying gold and copper on or near Iron lake. They also found cobalt bloom and calcite veins. The party consisted of Alexander McDonald Sidney Dolmage and Wilbur Allen, all Grand Trunk Railway employees.

Meanwhile important new finds in the Cobalt area proper continue to be reported from day to day. At La Rose location another rich vein has been found, the outcrop showing masses of granular silver. A strike on the Foster property near Giroux lake, of considerable richness, was found to lead directly into the adjoining University location, already one of the leading shipping mines. When followed up, it was found that the cobalt bloom and nickel ore were replaced by native silver, the vein having a width of five inches. It has been traced 300 ft. and is supposed to extend considerably farther. The discovery is claimed to be the richest yet made in the district. The Nipissing Mining Co., who own 1,500 acres fronting on Peterson lake, the property being generally known as the Carl mines, are putting in a hydraulic plant. They will pump water from the lake and wash the surface soil so as to lay bare the bedrock. In addition to being a less expensive and more thorough method of prospecting than trenching, they will secure such free silver as may be mixed with the soil. The experiment of applying the hydraulic system to cobalt mining is watched with a great deal of interest.

The question of the permanency of the camp appears to be settled beyond dispute by the experience of the larger and more developed mines, the general result of which is that the veins are holding out well at the lower levels. Several mines are now below 100 ft. and find the veins frequently richer than near the surface. On the First Discovery vein of La Rose, the shaft is down 230 ft. and another shaft has been sunk to 185 ft.

and much driving has been done at the 90 ft. level. A second drift has been made at 200 ft., so that an approximate estimate can be formed of the amount of ore in sight, the conclusion being that there is a sufficient quantity available to keep the mine running for twenty years. At one of the Trethewey mines two shafts have been sunk, one being down to the 100 ft. level, at which much driving and some stoping have been done, the output so far being about $250,000. The other mine has not undergone as much development, but it has yielded nearly $500,000 worth of ore. Repeated reports have been started as to the sale by W. G. Trethewey of his interest in the mines, but they are emphatically contradicted.

Prospectors were busy in the early part of the season in Bucke township, which adjoins Coleman township to the north, and presents similar characteristics. Almost the whole area of Bucke is now staked out, but it is asserted that much of the alleged prospecting work was done when the snow was on the ground and it was impossible to make discoveries, and that many claims consequently will be disallowed by the mining inspector. The Gilpin Cobalt Silver Mining Co. who have the pioneer location in Bucke, are pushing development work. Trenching has disclosed seven veins on this property and smaltite has been found at a depth of 15 ft. Six men are at work. It is claimed that gold ore to the value of $7.50 per ton has been found on the property immediately adjoining, as well as smaltite.

The bill amending the Mining Act introduced by the Provincial Government in the Ontario legislature, a synopsis of the leading features of which I have previously given, has been passed. But the other measure for the taxation of mining lands was withdrawn owing to the shortness of time remaining for its consideration. It is understood that the question will come up next year. The scheme for giving bonuses to smelters, which was a portion of the bill, also stands over, the position of the Government being that any money devoted to this purpose should not come out of the general revenue, but should be raised by a tax or royalty on mining or mineral resources.

CHICAGO, May 19.

Whether the present conference between the operators and miners will come to any agreement is the most absorbing question now before the mining men. On the whole it does not seem likely that they will, despite the fact that relations are friendly and in the past the Operators Association and the United Mine Workers have worked in closer harmony in Illinois than anywhere else. It is confidently expected by leading operators as well as miners that work will be resumed sometime in June. The basis for this opinion seems to be mainly the fact that by that time the present stock of coal will be used up. The railways can be very brave up to the time when there is no coal with which to run their trains—"then," argue the miners, "they must come to terms." The miners are standing absolutely firm, confident in the strength of their organization rather than their cause. The large operators have so far held together with unexpected unanimity and much more than 90% of the tonnage is tied up. There are many mines running; over half the miners say, though this is probably exaggerated. These are however exclusively small mines supplying local trade. Since April 1 the coal traffic of Indiana and Illinois has practically ceased, yet the reserve supply was so large that there has been no especial shortage nor any large increase of price. It is evident that this condition of things cannot last. The cutting off of such a large portion of the production of the Middle West can not be compensated by increased shipments from the East, so that a change is shortly expected.

When the strike began the operators had no thought of attempting the destruction of the Union and the disruption of the interstate agreement. Several things have since occurred to materially alter the situation. On the one hand they have been surprised at their own ability to stand together and, on the other, the course of the miners has been unexpectedly exasperating. The withdrawal by the Union of pumpmen and engineers, except where the scale of 1903 was promised, in the face of a definite and clearly understood agreement to the contrary, is felt to be inexcusable. The almost contemptuous refusal to grant to the operators here arbitration on the exact lines asked for by the miners in the anthracite field has done much not only to anger the operators but to prejudice the case of the miners before the public. To the original demands of the operators, the continuance of the 1904-05 scale and the adjustment of the cost of shot-firers, have been added the open shop, abolition of the pit committee and various other items, including the strangely sounding demand, "That all men shall be allowed to work eight hours a day or forty-eight hours a week at the option of the operator!" This phase of the eight-hour question will appeal to Western men as new, and the phrase illustrates well the straights of the coal operators of the Middle West.

The most acute irritation has arisen from the shot-firers' law. This law, which was enacted by the last Illinois legislature, provides that all shooting in the mines be done by shot-firers who must be employed by the company. The purpose was to reduce the number of accidents. Whether, if roof-falls be taken into account, it has done so, is still uncertain. A priori it does not seem a good principle to require one man to fire shots placed and loaded by others and, while there are certain safeguards, it is far from certain that they are effective. The result to the operators has been to increase the cost of the coal an undetermined amount ranging from one cent per ton, as estimated by the miners, to 10c, as estimated by the operator. The latter estimate includes indirect, as well as direct, cost. It was held by the operators that the Union in lobbying this bill through, indirectly raised the cost of mining and relieved its members of labor and risk, after making a contract with the operators governing these points. In this, as in withdrawing the engineers, they have so seriously violated their contract, as also in numerous petty and unauthorized strikes, that the operators are asking that some penalty in the form of bond or tax on wages be provided for any future violation, if a new contract be made.

A more serious matter than the cost of shot-firing is the liability incurred by the operators. The shot-firers are members of the Union and the operators have no effective way of controlling either them or the men, yet the operators are financially responsible for deaths or accidents. Another matter of long-standing irritation is the systematic discouragement of machine-mining in Illinois. Candid officers of the Union do not deny this, but they explain the conditions as follows: After the rest of the State had been organized and the pick-men had been brought into the Union, the machine-men, particularly in the Danville district, refused to join. In order to shut off production here and force the men into line, it was necessary to make it unprofitable for the operators to use machines. At the time it was regarded as a temporary move, but being found to help the Union, it has been stubbornly held to. Payment for mining on a mine-run basis has been forced by the miners, and is another long-standing grievance of the operators.

When the miners, two years ago, accepted a reduction in wages, and when, a few days since, in the anthracite field they returned to work under old conditions rather than strike, they exhibited most unusual reasonableness and Mr. Mitchell showed his greatest generalship. It is therefore surprising that in Illinois they refuse to rectify injustices which they can hardly help recognizing and which in fact many of them do privately recognize. The difficulty is probably less with the leaders than the followers. It is a prime essential for a labor leader to win or seem to win benefits for his followers, and in Illinois the officers of the United Mine Workers have been so successful in this particular that they have set themselves a standard difficult to live up to. They began in 1897 when by open and unrepressed violence at Virden they won against the un-united operators. This battle has become a sort of Lexington in their minds and is referred to as a sad necessity due to the stubbornness of certain individual operators. Since then, despite the organization and power of the Operators Association, conditions have improved and wages have mounted steadily. The strike fund has grown to nearly a million dollars and the miners have come to believe they cannot be defeated. The operators have collected some $6,000,000 in dues for the Union and have worked with them cordially in building up the system of collective bargaining and interstate agreements. Probably everyone who is familiar with the coal industry of the Middle West approves of this system of interstate agreements and regrets its passing, but it is difficult to see how it can be saved. The miners certainly will not go to work except on the 1903 schedule. Whether they will grant other concessions sufficient to compensate the operators for yielding this, remains to be seen. The Union officials cannot retain control of the organization if they back down on this show point after having won in Iowa, and with so many individual operators. The difference in cost on this point alone is not sufficient to warrant the operators attempting to bring in non-union men. The only shipping non-union mine in Illinois is now, after three years, still guarded by a stockade surmounted by search-lights and with Gatling guns. The immediate outlook, therefore, for more non-union mines is not encouraging. If, however, concessions can be made in the matter of shot-firers, machine-differentials, etc., it is possible an agreement based on the 1903 schedule can be worked out. If the operators can force arbitration by a national commission, they will almost certainly win more than this. If, however, the Union officials do not find themselves strong enough with their organization to make such a settlement, the operators are likely to be forced to settle on other terms. A few will fight, but the big fight under such conditions will come a few years later, when consolidation shall have gone a few steps further and the railways are in more direct control.

SALT LAKE, May 14.

E. A. Wall, of Salt Lake, owner of the Starless group of Bingham, announces that he will equip that property with compressor and other machinery. The Wall mill, where the ore will be treated, is to be overhauled and enlarged.

The Silver King Mining Co. has filed answer in the trespass and damage suit, instituted some aime ago by the Magnolia-St. Louis Mining Co., entering a general denial to allegations set forth in the complaint. While admitting the extraction of ore from the disputed ground—the St. Louis and Magnolia claims at Park City—defendants justify their action on the ground of apex rights. The suit was brought to recover $900,000, alleged to be three times the value of ore extracted from one level, of which plaintiffs had knowledge. Following the filing of the answer, the plaintiff filed a suit in equity in the Federal court demanding that the Silver King Co., and David Keith and Thomas Kearns, president and manager, respectively, show cause why an injunction should not issue restraining them from mining or extracting ore from the property in question. The court is also asked to make an order permitting the engineers of the Magnolia-St. Louis Co. to enter workings of the defendant company for the purpose of inspection.

The Sacramento Gold Mining Co. has been sued by the Herschel Gold Mining Co. for trespass and damages in the sum of $231,000. The plaintiffs allege ore has been unlawfully extracted from the Remnant and Pegasi claims, at Mercur, in Camp Floyd district. The Yampa Smelting Co. at Bingham has six MacDougall roasters and two Edwards furnaces in operation. Five more MacDougalls have been ordered. The directors of the Silver King Mining Co. have reduced the monthly dividend to $50,000, the management giving pending litigation, and the probability of the purchase of additional ground as the reason for the cut. The Silver King Co. has paid $10,200,000 in dividends.

The ore shipments from Park City last week aggregated 2,366 tons, the shippers and amounts being: Daly-Judge, 482 tons ore, zinc middling, 250; Kearns-Keith, 135; Daly-West, 600; Silver King, 612; American Flag, 264; New York Bonanza, 23. The production of Tintic district last week aggregated 183 carloads, the shippers and amounts being: Gemini, 23; Centennial Eureka, 50; Eureka-Hill, 6; Beck Tunnel, 6; May Day, 7; Yankee Con., 5; Uncle Sam, 6; Brooklyn, 2; Bullion Beck, 10; Dragon Iron, 16; Swansea, 1; Scranton, 2; Ridge & Valley, 4; Black Jack, 5; Lower Mammoth, 3; Grand Central, 8; Carisa, 4; Mammoth, 20; Ajax, 2; Victoria, 2; Victor, 1; Undine, 1.

At the Carisa mine, in Tintic district, connections have been made with the Sioux-Ajax tunnel through which ore will hereafter be sent out at reduced cost.—New equipment has been ordered for the Star Consolidated mine at Tintic, including a hoisting plant. Recent development in this mine is encouraging.—The Mammoth Mining Co. of Tintic district has disbursed another dividend, making a total of $2,020,000.—The Honerine drain tunnel, at Stockton, is in 10,200 ft. The mill is still idle.—The zinc concentrator at the Hornsilver mine, in Beaver county, is in operation and several car loads of zinc concentrate have been shipped to Iola, Kansas. The plant is reported to operate successfully.

The Overland mine at Sunshine, E. W. Clark of Ophir, Utah, manager, will soon be in shape for regular production. For a year the company has been sinking a new shaft, necessitated by the caving of the old incline. It is expected the mill will be running before July 1. The ore now being developed, is said to run over $4 gold per ton.—At the annual meeting of shareholders of the Annie Laurie Mining Co., operating in the Gold Mountain district, George A. Baird, of Sharon, Pa., was elected president; A. A. Ball, Kimberly, Utah,

secretary, and S. M. Levy, of the same place, manager.—The first month's run of the Sevier Consolidated Co.'s mill in Gold Mountain district, is said to have given satisfactory returns. The gold saving on the plates was 94 per cent, and of the gold and silver contents combined, 90 per cent.—The Ohio Copper Co. has decided to sink a new shaft on the All Well's vein at Bingham, and will install machinery to carry development work to greater depth than heretofore.

June 5 has been set for the hearing of argument in the pending smelter-smoke cases.—An important strike is reported at the Utah Consolidated mine at Bingham, said to be in virgin ground and that the orebody, which is 25 ft. wide, carries seven per cent copper.—The management of the Swansea mine, Tintic district, will re-open the 800 level. The company is shipping 700 tons monthly.—The management of the Boston Consolidated Mining Co. has placed an order for 312 Nissen stamps for the new Garfield concentrator, construction of which has begun. Preliminary tests at the company's experimental mill in Bingham showed that one stamp will handle ten tons of the company's porphyry ore per 24 hours.

BUTTE, May 19.

John D. Ryan, president of the Anaconda Copper Mining Co., at the recent annual meeting in Butte, submitted the following report for the year ending December 31, 1905:

Receipts.

Sales of copper, silver and gold	$17,429,098
Royalties	65,441
Dividends on investments	32,100
Rental of water rights	50,000
Miscellaneous receipts	96,285
Net profits of subsidiary departments after deducting depreciation	300,174
Copper, silver and gold on hand—copper at cost, silver and gold at selling price	5,761,105
Total receipts	$23,734,203

Disbursements.

Copper, silver and gold on hand at the beginning of the year	$ 6,336,427
Mining expenses, including development and depreciation	5,403,585
Ore, matte and copper purchases, including transportation and purchasing expenses.	349,258
Transportation of ore from mines to reduction works	226,515
Reduction expenses at Anaconda, including depreciation	4,046,822
Transportation of metals from West to East, refining and selling expenses	1,729,175
Administration expenses	54,699
Total	$18,146,481
Balance	$ 5,587,722
Add. interest	131,106
Balance profit to balance sheet	$ 5,718,828

The balance sheet as of December 31 shows:

Assets.

Mines, mining claims, land, etc	$20,430,757
Buildings and machinery, saw mills, etc	4,267,516
Investment in sundry companies	531,560
Total fixed assets	$25,229,833
Insurance unexpired	56,079
Materials and supplies for future use	1,508,761
Deferred assets	1,564,840
Merchandise held for sale	628,491
Copper, silver and gold	5,761,105
Loans and accounts receivable and cash	6,749,605
Current assets	13,139,201
Total assets	$39,933,874

Liabilities.

Capital stock, 1,200,000 shares of $25 each	$30,000,000
Accounts, wages and pay and taxes accrued	1,626,286
Dividend warrants, not presented	17,016
Div. No. 21, payable Jan. 18, 1906	1,050,000
Current liabilities	2,693,302
Balance surplus, Dec. 31, 1904	4,971,744
Profit for year ended Dec. 31, 1905	5,718,828
Total surplus	$ 10,690,572
Deduct dividends No. 10, 20 and 21	3,450,000
Surplus	7,240,572
Total liabilities	$39,933,874

The mines, reduction works and subsidiary departments were in continuous operation during the year, and no unusual accident or extraordinary interruption occurred to interfere with the work. The mines were developed during the year to greater depths than have been reached heretofore in the Butte district, and with the increased depths the life of the mines and grade of the ore are assured for many years to come.

The Anaconda mine is now opened on the 2,400 ft. level, and the Never Sweat and St. Lawrence on the 2,200, and at these depths the veins show fully as good in size and in value of ores as in any of the levels below the 1,000 ft. level.

The mining properties owned by the company, outside of the working mines, have been developed to a considerable extent during the year, with satisfactory results and it is the policy of the management to continue especially during prosperous times, active work in developing the large holdings of the company that are not now productive.

The arrangement under which the company leased the new reduction works of the Washoe Copper Co. and abandoned and dismantled its own reduction works at Anaconda has been in effect long enough now to demonstrate fully the wisdom of the trustees in entering into it.

During the year 1901, which was the last full year during which the company operated the old reduction works, 1,390,460 tons of ore were treated, and the capacity of the plant as it stood was reached; to modernize and increase its capacity was decided by competent engineers to be impracticable.

The new works of the Washoe company were leased for a long term of years on a reasonable rental basis which rental covers only interest on the amount the plant cost, with usual allowance for depreciation.

During the year 1905, 1,626,306 tons of ore from its own mines, and slags, slimes and flue-dust taken from the old works, were treated at the new reduction works at a difference, after paying rental, of $1.5886 per ton in increased savings of metal values and decreased cost, as compared with the old works in the last year of their operation. This saving amounts to $2,583,549 on the ore treated for your company during 1905.

In addition to the advantage of increased savings and decreased cost realized under the new arrangement there has been recovered in salvage and from metal values in the dumps of the old works since they were abandoned, $3,645,625 net profit to March 1, 1906, and the cupreous material yet in sight at the old works is estimated at about $1,750,000, or, with net profits already realized, about 85% of the book value of the old works when they were in operation. Included in the book value of the old works is the refinery plant, which still stands intact, ready for operation, but the company does not continue its operation as contracts have been made with refineries at the seaboard that make it more profitable to ship the product and have it refined at the seaboard than to refine it at Anaconda.

Summing up, your trustees find they have realized for your company from the arrangement made with the Washoe company for the lease of the new reduction works, an additional profit amounting to a very large sum each year on the output of the mines, and have recovered practically the entire value of the old works in selling off the machinery and working over the slag dumps and slime ponds that could not be worked profitably in the old works.

The mines in operation during the year were the Anaconda, Never Sweat, St. Lawrence, Mountain Consolidated, Bell, Diamond and High Ore. The Galatin and J. I. C. were opened and operated and a limited tonnage taken from them in the latter half of the year

The mines of the company produced 1,543,316 wet tons of ore, of which 61,149 dry tons of smelting ore remained on hand at the reduction works at the close of the year, leaving 1,470,694 dry tons treated at the works.

The plants and equipment of all of the mines of the company are capable of doing the work satisfactorily and economically for a long future. The use of electrical power has largely increased and will continue to increase at the mines, effecting a very considerable saving over power generated with coal. At the present time most of the air-compressing machinery is electrically driven, and it is contemplated to do most of the pumping from the mines with electric power.

The mines of the company are now drained almost entirely through the pumping plant in the high ore shaft, and the precipitating plant, through which the water from the mine is taken, extracted during the year copper sufficient to pay all pumping expenses.

During the year the Anaconda shaft has been sunk 400 ft. and cross-cuts completed to the veins on the 2,200 and 2,400 ft. level; the Never Sweat shaft has been sunk to the 2,400 ft. level and cross-cuts completed and the vein opened on the 2,200-ft. level; the St. Lawrence shaft has been sunk to the 2,000-ft. level (equivalent to the 2,200 Anaconda) and cross-cuts driven to the vein on that level; the High Ore shaft, now at the 2,200-ft. level, is being sunk and will be continued to a depth equal to that of any of the company's mines; the Diamond and Mountain Consolidated shafts are both opened to the 2,200 ft. level, and have not been added to in depth during the year.

The reduction works treated for all companies during the year 2,650,868 tons of ore and other cupreous material. Of this, 1,470,694 tons of ore from the mines, 44,566 tons of slime and 23,900 tons of flue-dust, 82,789 tons of slag and 4,357 tons of miscellaneous cleanings from the old works were treated for your company from which was produced 95,443,730 lb. fine copper, 3,116,880.945 oz. silver and 19,165.429 oz. gold, in the form of anodes, which were shipped to Eastern refiners.

During the year the Washoe Copper Co. added to the blast-furnace capacity of the works by making connections between furnaces and reconstructing the plant so that three large furnaces and one small one are now in operation, with a daily capacity of 4,700 tons of all material, as against seven small furnaces with a daily capacity of 2,700 tons at the beginning of the year Eight new McDougall roasting furnaces were added in the calcining plant, and it is intended by the Washoe company to still add more roasters, as the present product of the concentrator is greater than can be satisfactorily handled with the present capacity. The small reverberatory plant now consists of two furnaces 102 ft., four 112 ft., and one 115 ft. long, with boilers in flues of all the furnaces, furnishing steam about sufficient to operate the smelter power-house.

The concentrator is being equipped with electric power which will show a material decrease in the cost of operating when installed.

These extensions and improvements are being made by the Washoe Copper Co., and your company will pay increased rental based on the increased cost of the plant.

BUTTE, May 20.

The machinery for the new hoisting plant of the East Butte Co. has been received and is being put in place. The equipment consists of engine, air compressor, three boilers, furnace frame and smokestacks. The company is cutting a station at the 400 ft. level and a pump will be installed there. With the new plant, sinking will be more rapid and economical. The various lessees are shipping ore, and the bins are full.

La France Copper Co. has begun pumping water from the Lexington mine, which for years has been flooded up to the 550 ft. mark. The mine is 1,465 ft. deep and there are several miles of workings below the water level. The pumping capacity of the machinery is about 1,000 gal. per min. at which rate it is expected the water can be pumped out in about four months. The pumping will not interfere with the mining that has been going on in the upper levels, from which 100 tons of copper and zinc ore has been shipped daily for some time. United Copper is the principal owner of La France.

The Columbus-Butte Mining Co., organized to succeed the Jenny Dell Mining Co., has itself become involved in debt and has been practically forced to the wall. The company has been developing the October and Jenny Dell mines but had little money to go on, and was unable to take up the bonds on the properties. The stockholders, fearing to lose all their investments, are trying to raise money. The Jenny Dell is in the northwestern portion of the district.

The Butte-Milwaukee Mining Co. is making preparations to put up a hoisting plant on the Colonel Sellers and sink the shaft to 1,200 ft., the purpose being to develop that mine and the Bird from that shaft. Another shaft will be sunk on the Florence. The Pollock is developed and is worked by lessees. In addition to the mines named the company also owns the Stonewall, in Butte district, and seven copper claims in Argenta district.

The company, to tunnel under the mountain range east of Butte, has decided on the site for the adit which will be driven 4,500 ft., far enough, it is thought, to cut the veins traversing the property. It will give a depth of 2,500 ft. The Corrys, who formerly owned the ground now embraced within the Pittsburgh & Montana Co.'s holdings, are at the head of the enterprise, and a number of mining claims owned by them will be put into the company. Sinking has been resumed by the Eagle Mining Co. on its property north of Butte, and the shaft will now be sunk to 500 ft. Pumping machinery has been installed.

The Lewisohn General Development Co., which for several months has been pumping water from the Altoona mine, has cleaned out the old workings and J. Parke Channing is making an examination of the properties, which will determine whether the Lewisohns will take up the options on the Altoona group or not.

MINING SUMMARY

ALASKA.

In Tanana district, gravel dumps gotten out during the past winter are numerous and large. It is estimated the gold output will be 50 larger than that of last year.—— The Arctic Mining Co. is reported to have made a big strike in the Port Clarence district, where they have 12 ft. of gravel, seven ft. of which is pay-dirt. This is on Sunset creek, where it owns all of the creek and bench claims. Pans running as high as 25 c. have been found on the benches.—— The exact distance from Dawson to Fairbanks by the winter trail, by way of Eagle and Circle, is 410.7 miles.—— Press dispatches of May 22 state that Fairbanks, the metropolis of the Tanana region, was destroyed by fire on tha date.

ARIZONA.

COCHISE COUNTY.

The Cole shaft of the Lake Superior & Pittsburg, near Bisbee, is to be sunk to 1,500 ft. In addition to this a third shaft will be sunk at this mine, southeast of the present mine and near the Calumet & Pittsburg line. Work will begin this year. This mine is now producing copper at the rate of 10,000,000 lb. per year, which will be increased later in the summer with the blowing in of No. 4 furnace.—The Copper Queen is to put a large electric pump in the Czar shaft, to handle all water from the upper end of the mine. The Copper Queen is employing 4,000 men at the mines and smelters, and is turning out 8,500,000 lb. of copper monthly.

The mines at Bisbee, known as the Bonanza Circle, are to be incorporated under Minnesota laws, absorbing the Calumet and Pittsburg, Lake Superior and Pittsburg, Pittsburg and Duluth and the Junction companies under the same management. These properties adjoin the Calumet and Arizona mines. The merger is planned to secure greater economy in the mining and smelting operations. The properties are so situated that they are inter-dependent and the shafts of each are so situated that they are necessary to the economical operation of their neighbors. The new concern will be one of the largest copper mining companies in the country. Production is now confined to shipment of ores to the Calumet and Arizona smelter at Douglas, and it is proposed to erect separate smelters, largely increasing the output.

(Special Correspondence.)—A gold discovery has been made in the Saddle Mountain district by Newton Robertson, I. N. Robertson and O. N. Bantu, of Safford. Two samples of ore from the Summit claim, taken near the top of the range, assayed respectively $48 and $59 per ton gold. The shaft on the Summit claim has been sunk 12 ft. and the vein has widened from four to eight inches. The last assay ran about $80 gold.

Tombstone, May 20.

MOHAVE COUNTY.

(Special Correspondence.)—F. H. Crafts, of Chloride, 22 miles north of Kingman, is closing up some mining deals. These sales will inaugurate new mining activities. C. H. Burlock, of the San Diego Mining Co., is at Union Pass superintending development of the company's property. Richardson brothers have completed driving 125 ft. on the 300-ft. level of the O. K. mine at Union Pass.—T. Ewing, being short of water at the Vivian mill, in San Francisco district, has purchased the Cottonwood canyon water and pipe line and is now laying a two and one-half inch line from there to the mill.—At the Victor and Virgin group in the River range, two shafts are being sunk with three shifts. When the mine is ready to produce ore in sufficient quantity, Mr. Ewing will erect another mill for this group, laying a branch water pipe from the one now being laid.—At the German-American mine, in San Francisco district, the new compressor plant is running smoothly and the machine drills are in constant operation. The mill is running day and night on ore taken out in development.—W. J. Agler, superintendent for the Treasure Hill Mining Co., has commenced development on the company's mines at Stockton Hill, with Morgan Jones as foreman. The first work done under the new management resulted in a rich strike of high-grade ore, which was opened up in one of the lower tunnels on the Dictionary ground. A winze was started from the bottom of this old tunnel to connect with the next lower tunnel, and in this winze the rich ore was found. It is one of the most important strikes made in that district in many years.

Kingman, May 20.

PINAL COUNTY.

(Special Correspondence.)—The Calumet Co., of Douglas, has a representative on J. K. McCarthy's group at Riverside, figuring on the purchase of that property. Sinking on Shaft No. 2 is about to be commenced.

Douglas, May 20.

YUMA COUNTY.

E. T. Larson of Ironwood, Mich., has taken up his option to purchase the lease of the Golden Eagle & Bonanza Gold Mining Co., situated at Harqua-Hale and has organized the Harqua-Hale Mining Co. to own and operate the lease. Articles of incorporation have been filed. The property has a bullion record of $5,000,000, but has been shut down for several years. The new Santa Fe road to Salome passes near the property which is equipped with a 40-stamp mill, hoisting plant and a pipe line five miles in length, which furnishes a water supply. The deal includes title to the tailing from all the ore previously mined, estimated in excess of 100,000 tons, which it is thought can be treated profitably by cyaniding. In addition to this, there are 50,000 tons of ore available on the surface.

CALIFORNIA.

AMADOR COUNTY.

The Mitchell mine has been cleaning up the ore left on the dump by the lessees. The average of the rock was low, and whether it will leave a balance over the milling expenses, to go toward the liquidation of the claims of the lien holders is doubtful.—At the Oneida mine a 12-ft. vein has been exposed on the 2,400-ft. level. It is low grade. The vein will be explored for the pay-shaft.—The Wildman mine at Sutter creek is again in operation. Underground work was started this week.

KERN COUNTY.

It is reported that ore containing both gold and platinum has been discovered at Linns valley. Thus far only qualitative tests have been made.

MONO COUNTY.

A strike is reported four miles from Masonic. The district is described as consisting of large dikes of mineralized porphyry containing gold. Thus far only low-grade ore has been found, but the ore exists in large quantities, and pans free gold. A townsite has been laid out, and a number of people have gone there. The camp is near the Nevada line.

NEVADA COUNTY.

The New York-Grass Valley Mining Co. has decided to put in a 100-ton cyanide plant at their mine at Grass Valley. The capacity of the mill is to be increased by the addition of stamps. Coarser crushing is to be tried, and it is thought that by this increased capacity, and operation of the cyanide plant, a higher percentage of gold will be saved at less expense.

PLACER COUNTY.

J. W. Price has located what he believes to be the extension of the Dairy Farm copper mine. The discovery was made in the bed of Bear river. He has sunk several prospect shafts on it, the deepest being 30 ft. At that depth the vein is six feet wide. Some of the ore contains a good percentage of copper and some is free-milling gold ore. Forty men are employed at the Dairy Farm mine. At a depth of 400 ft. the vein in that mine is 70 ft. wide.

SAN BERNARDINO COUNTY.

It is reported that the vein of a new discovery has been traced for 4000 ft. with a surface width of six feet, near Kelso. Samples assay from $7 to $120 per ton. Kelso is a station on the Salt Lake railroad, about 15 miles from the Nevada State line, in New York district, a few miles west of Manvel.

TRINITY COUNTY.

The John Poeth claim on Big Boulder creek, a branch of Coffee creek, is being developed by a shaft which is down 150 ft. and drifts, one each way, at the 140-ft. level. The vein maintains a width of about two feet throughout the shaft and the drifts. A ditch and pipe-line are being put in, preparatory to installing a compressor. A cyanide plant will be added later in the summer. At present there are ten men working under the direction of J. B. Batz.

The Golden Jubilee, just south of the Poeth mine, is actively preparing to resume stoping and milling. A crew of men is overhauling the mill and cyanide plant and repairing the ditch and replacing the pipe-line. When in running order the mill and cyanide plant will handle 20 tons per day. The milling will be delayed because of a loss of time due to the forwarding of supplies from the East which would have ordinarily come from San Francisco. In the lower tunnel, the orebody has been encountered and development shows an enormous amount of ore between this and the upper level. The work is under the direction of W. L. Chapman.

The Blue Jay, the scene of the Graves brothers' strike in 1897, is being developed by a cross-cut tunnel. They have recently cut the vein, which is 35 ft. wide and assays have given from $8 to $117 per ton. Further development in the shaft is delayed pending the arrival of a hoist and pump. This property is in Morrison gulch, above the Morrison gulch hydraulic mine.

The Bonanza King is building a saw-mill and road preparatory to installing a 10-stamp mill. At present 45 men are employed; this force is to be increased later.

The Caribou mine, on the Salmon river side, will soon have a force of men driving the cross-cut tunnel to intersect the large vein which outcrops on the surface and driving on the small veins that have already been cut. The tunnel will have to be driven about 1,000 ft further.

COLORADO.

GILPIN COUNTY.

At the Gulch mine in Lake gulch, a depth of 450 ft. has been reached in the shaft, sunk on a vein of low-grade milling ore with a streak of fair-grade smelting ore. The property is owned by William Mitchell and sons. Several cords of mill ore are in the bins and a shipment of smelting ore is being taken out.—At the Chemung-Belmont mine near Lake gulch, a depth of 790 ft. has been reached.—A new 50 h. p. boiler has been put in the Pozo mine, in Nevada gulch.—A new shaft building has been erected at the Argo mine, in Russell district, by the Faraday Mining Co., in which Chicago people are interested, and machinery, consisting of a 10 by 12 single engine and a 35-h.p. boiler, has been installed. The shaft is down 160 ft. and is to be sunk 200 ft. deeper.

SUMMIT COUNTY.

(Special Correspondence.)—Numerous new strikes have recently been reported in Breckenridge district. In the Jessie mine a four-foot vein of rich ore has been discovered between the second and third levels and the management is opening this up. Three feet of this vein is streaked with lead sulphide, rich in gold and silver. The other foot is high-grade milling gold ore which assays from 200 to 300 oz. silver per ton and 20 to 25 oz. gold, making a total value of $550 to $700 per ton. The company's mill is being put in good shape and will be started up next month.—The old Union Mining and Milling Co. is running its mill to its full capacity on full time. The main tunnel workings are producing good concentrating ore. The Wellington mine is making regular shipments of zinc and lead ores, and is shipping its milling ore to the Old Union mill.—The Oro mine in French gulch, which in five years produced over $1,000,000 in gold, silver and lead, but which has been in litigation for 13 years, is again in shape to resume work, the litigants having arrived at an amicable settlement of their differences. This mine may now be expected to make big shipments, adding materially to the production of Breckenridge district.—The Beaver Creek Gold Mining Co., which has been operating the Lucky mine the past 18 months, has purchased the Minnie mine and mill which adjoins them on the southwest on Mineral hill. The Minnie is being operated under lease and will so continue until the end of July when the new company will take possession.—The Country Boy mine is worked by the Lanyon Zinc Co. under lease. The management is drifting on the vein and preparing to stope ore which runs 40 to 55% zinc. The pay-streak is from 24 to 38 in. wide. The ore is shipped to Iola, Kansas.—The Mary Verna Mining Co., operating the Ten Mile canyon in Frisco district, has struck lead ore in their main tunnel which runs into Royal mountain from the Ten Mile river side and taps the vein at a depth of 1,200 ft. This is an important strike as it is the deepest work in this mountain.—Albert Newton has sold his property, adjoining the Victoria mine on Mount Royal, at Frisco, to a company, which will push development with vigor.—The Summit Banner Placer Mining Co., operating under the management of Lemuel Kingsbury in Iowa gulch, is about to start the season's operations. The pipe line and boom are now in order and washing has commenced and the entire plant will be in full operation by the 20th of the month.

Breckenridge, May 20.

TELLER COUNTY.

The Mine Owners' Association at Cripple Creek has decided to begin the prosecution of persons accused of stealing high-grade ore in the district, and criminal action against several alleged violators will be begun. It was reported to the association that there was $9,000 in the special fund, derived from high-grade ore which had been confiscated, to be used in the prosecution. One of the members of the association said that the action taken was the beginning of a

movement which would make high-grading unknown hereafter in the district. S. Jensen, an assayer, is one of the men to be prosecuted by the association. It is alleged that a number of the high-graders, through Jensen as agent, shipped a car of ore to a reduction plant in Pueblo. This ore was confiscated by the Mine Owners' Association on the ground that it was stolen. Jensen brought suit against the railroad company, securing judgment for $300, and as a result, the Mine Owners' Association will take the case to the Supreme Court. Jensen then sued the Eagle sampler, which handled the ore for the association, but he lost his case, Judge Cunningham deciding against him a few days ago. The ore was valued at $2,700.

IDAHO.

BLAINE COUNTY.

L. A. Gowdy, a sheepherder, while attending sheep on the Wolftone slope of the Red Cloud mines last fall, discovered the outcrop of a vein of galena, and with a piece of hoop-iron he turned up 50 lb. of ore. He filed notice of the location in Hailey, naming his claim the Olive. Being too late in the season to do anything, he awaited the return of spring, when he sold a half-interest to A. Holmes, who went to the claim a few days ago and took samples, one of which assayed $232.20 silver, and 71½% lead; the other 99 oz. silver and 32½% lead.

LEMHI COUNTY.

The Queen & Crescent Mining Co., operating the Queen of the Hills mine near Salmon, have cut fine ore in their crosscut at 1038 ft., and the miners have driven ten feet into the vein without reaching the further wall. The face is 405 ft. from the surface.—The Junction Mines Co. has ordered the shaft sunk another 100 ft.—The placer season is opening. There is sufficient snow in the mountains to make a prosperous season for the placer miner if the snow does not go off with a rush.—Details of the transfer of the Yellow Jacket mine have been completed, and this property, after an idleness of ten years, will be started up July 1. The mine is equipped with a 60-stamp mill run by water-power.

MICHIGAN.

KEWEENAW COUNTY.

A mill with eight gravity stamps is being erected on the Tamarack Co.'s Cliff mine for the purpose of treating part of the waste pile at the abandoned property. Henry Warren is in charge of this work, and will operate it on a leasing arrangement, independent of the Tamarack Co. Jigging and other methods of concentration are to be applied to the recovery of copper. The Cliff dump accumulated when attention was given largely to mass copper and stamp copper was a secondary consideration. A grade of rock was rejected at that time which might profitably be sent to mill under modern conditions. It is the calculation of Mr. Warren that the Cliff dump contains enough rock of this character to justify an effort to recover the copper in it. It has been exposed for many years to the weather and therefore will crush much easier than fresh rock.

NEVADA.

DOUGLAS COUNTY.

The new camp called Buckskin is 15 miles from Wabuska. Prospectors and others are going into the new district and some good prospects are reported. The goldbearing veins are found in what is described as rhyolite, and in a general way the geology is said to resemble Goldfield, though, as yet, no sensational strikes have been made. The principal prospect is the Kennedy mine which has already been incorporated. A shaft is being sunk on this property and is down 25 ft., on a four-foot vein which is said to assay $80 in gold. Wood, suitable for fuel, and water are obtainable in the district, which is six miles long and two and a half wide. On the Iron Mountain a shaft is down 40 ft. and prospects well. The townsite has been incorporated, and most of the lots sold. At present the town consists of tents and tent-houses.

LINCOLN COUNTY.

G. Walmouth and F. Ennis, owners of the Diamond group, on Virginia river, brought into Caliente samples of ore from the bottom of a 50-ft. shaft sunk on their Ruby claim. They sunk on a four-inch vein of ore going $80 per ton. This vein widened, and at 50 ft. was the full width of the shaft, but dropped in value to $20 per ton gold. Six feet deeper the vein pinched to two feet, but showed gold going $450 per ton. They are sinking, and when they reach the 100-ft. mark will crosscut and drift.—— A strike of gold-silver ore is reported from the Green Mountain Boy, west of Caliente and south of De Lamar. The owners, Foote, Richards & Blake, have drifted 140 ft. on a 26-inch vein of $45 ore and have struck a blind lead showing $132 gold and silver in a three-foot vein. They are sacking ore for a test shipment.

LINCOLN COUNTY.

(Special Correspondence.)—The Quo Vadis group 23 miles southeast of Las Vegas, has been bonded, and deed placed in escrow, in First State Bank at Las Vegas. Consideration $100,000. The bond is from A. D. Catlin and co-owners, to John E. Phillips of Denver, for himself and co-owners, among whom are J. A. McKinney and A. D. Shoup, of Colorado Springs, who have been here with Mr. Phillips examining the property. Mr. Shoup represents Verner Z. Reed. Harry Adsit has also been here in this connection.

The Lucky Strike group, 27 miles northwest of Las Vegas, has a car loading at its side track for initial shipment.

The Potosi group, 25 miles southwest, is shipping 50 tons daily. The threatened litigation on this group has been compromised.

The Nevada Home Oil Co., with property 45 miles northwest, expects to commence boring soon. The surface indications are stated to be favorable.

Las Vegas, May 21.

NYE COUNTY.

(Special Correspondence.)—At the Consolidated Manhattan, of East Manhattan, the tunnel is now in 44 ft. At 38 ft. a vein was encountered, five feet wide, which gave assays of $30 per ton gold. This vein is only one of a series which traverses the company's property. A contract was closed the early part of the week to drive the tunnel 200 feet.—The Manhattan Mammoth adjoins the Consolidated Manhattan on the east, and is an extension of the vein which crosses the Consolidated holdings. The company are developing their property by tunnel, and will soon have a compressor installed. They have the same character of ore as their neighbor. A contract for 200 ft. of work has also been let.—The Manhattan Buffalo is west of the Consolidated Manhattan at East Manhattan. Development consists of two shafts. Both are in ore.—The Manhattan Consolidated, the first mine of the camp, is still holding its reputation. The force has been increased. Shipping ore is being piled on the dumps.—The Manhattan Mother Lode joins the Manhattan Consolidated on the southeast. A tunnel is being driven from the base of the hill, in which good ore has been cut.—Another vein was found recently on the Iron Queen claim of the Cowboy Co. This vein consists of black quartz similar to that found on the Georgey group at Central, and asays well from the surface. The company shaft on the Iron King claim of the Cowboy Co. is improving as depth is gained. The heavy iron sulphides which were first encountered at a depth of 60 ft. are still being found. A combination of men have leased the surface of the Iron King for placering. They will install dry washers. One machine is on the ground, and others will follow.—The shaft on the Bullhead claim, west of the Cowboy, is high grade ore, and shipments will soon be made. They are working in sulphide ore.—The hoist on the property of the Manhattan Dexter is working to its fullest capacity, and ore is being sacked. The shaft is down over 200 ft.—At the Manhattan-Nevada Gold Mines, the company shaft and drift are progressing, and they expect to soon reach the black quartz ledge cropping prominently on the surface of the Georgey group. Four veins have been cut in this drift, which is in 28 ft.—Surface prospecting has been carried on the last few days on the Copper Farm, El Dorado No. 1 and El Dorado No. 2 claims of the Manhattan Nevada Gold Mines, and several veins have been found.

Manhattan, May 20.

WHITE PINE COUNTY.

At Ely several of the large mining companies are getting well-drilling and diamond-drilling outfits, to test their ground in advance of the usual mine development. Recently the Giroux Co. received a diamond-drill having a capacity of 1,200 ft., and the Ely Central Co. have two of the same kind coming.

NEW MEXICO.

SIERRA COUNTY.

The Sierra Consolidated Gold Mining Co. has installed a large hoisting engine on the Opportunity mine where they will sink a three-compartment shaft. At the shaft on the Snake claim, which is now down 300 ft., sinking is being continued. The company has the Hager saw-mill under lease, and is turning out lumber for use at the mines and in the construction of the 50-stamp mill which it will put up on the Snake mine.

The Empire Gold Mining and Milling Co. is running steadily with a large force on the Bonanza mine. It now has the mine connected with its 20-stamp mill by a narrow gauge railroad; the mill is running steadily on ore from the Bonanza mine.—The Black Peak Gold Mining Co. is working the Wicks mine under lease. R. H. Hopper is working men on copper properties in the Caballo mountains, an undeveloped mining district, where large bodies of copper ore are being developed.

OKLAHOMA.

LOGAN COUNTY.

The Rosedale Mining Co., a Kansas City concern, has completed a cyanide plant at Mount Scott, in the Wichita mountains. Its capacity is 25 tons daily. The company's ore is said to assay $4 gold per ton. A carload of machinery was received during the week by the Kentucky Mining Co., also a Kansas City concern, and it is being transported to the mines at Mount Sheridan. A reduction plant will be established this summer.

OREGON.

BAKER COUNTY.

A strike of rich ore is reported in the Gold Bug mine near Sumpter. The water-power plant is being hurried to completion. The strike recently reported from the Imperial is holding out well. Stoping has been commenced on the orebody while the drift is continued. The Highland mine, near Baker City, has begun operations with a full force, and the mill will be started up. The mine has been undergoing development for some time and there are now more than a mile of underground workings on this property. The mill has a capacity of 100 tons daily. Underground work will be confined to extending the main drift and completing raises.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Homestake Co. will enlarge the building of the slime-plant on McGovern hill at Deadwood. This building will now be made 210 ft. long, and it will contain a waste-water tank which will have a diameter of 20 ft. and a depth of 16 ft. The heating boiler is to be in the south end of the building.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence.)—The Pearl Consolidated Mining Co. has shipped 16 carloads of gold ore to the B. C. Cooper Co.'s smelter, at Greenwood, B. C. The ore averaged $12 to $13 a ton. In the stope above the bottom level, 165 ft. north of the shaft, the ore has improved during the past week. The crosscut from the drift southward on that lead has not reached the hanging wall, but the ore is also improving. The winze below the 330-ft. level of the Ben Hur is down 45 ft., and the ore is of the best average grade that was ever broken in the mine. Streaks of sulphide, rich in gold and silver, are becoming frequent.

Republic, May 19.

OKANOGAN COUNTY.

(Special Correspondence.)—The Copper World Extension mine is reported to have resumed work on the shaft, which will be sunk from 200 to 500 ft.—John Wentworth, superintendent of the Copper World, on Palmer mountain, has returned from Ohio where he secured funds for resumption of work. He will begin sinking on the vein, in pay ore, 800 ft. west of the Copper World Extension shaft, and will follow the ore. He has tents for a temporary camp, and will make permanent camp by building cabins during the summer. This company is planning an aerial tramway from Sinlahekin valley at the proposed spur from the Vancouver, Victoria and Eastern railway to the Q. S. mine. The Ruby Co., operating at the base of Mount Chopaca, has carried its raise in ore 200 ft. above the lower tunnel level. A five-foot vein of low-grade material overlies the rich streak all the way, the latter being 20 in. wide. The two streaks are broken separately, but the ore will be held for shipment.—At the Mountain Sheep mine, three miles north of the Ruby, the lower tunnel has 700 ft. to run to reach the vein opened in two upper tunnels. The ore is partly sulphantimoniate, but also carries galena in quartz gangue. Some of the former is rich. This company has ordered a 40 h. p. boiler and a compressor to be driven by water power, derived from Chopaca creek. Machine drills will be used.—An additional Wilfley table will be installed at the Prize mill, on the Similkameen river, near Nighthawk. A chute is being constructed from the mine to the mill. Some rich concentrate is being sent to the smelter.

Loomis, May 19.

WISCONSIN.

IOWA COUNTY.

Mining has taken a boom in and about the town of Mineral Point, where lead and zinc ores are being successfully sought, by the owners of town lots and farms, and by others. Drilling outfits are busy in back

yards and in all parts of town, as well as out in the country.—The Temby Mining Co. will put in boilers and pumps, unwater the shaft and prospect their ground. —The Gollmer Mining Co. has struck ore and will sink a shaft.—The Golden Rod Co. will prospect their property with a drill. This is an old mineral district which has been idle for many years.

BRITISH COLUMBIA.

Following are the ore shipments of the Boundary mines, in tons, for the week ending May 12: Granby mines, Phoenix, 16,257; Skylark, Skylark, 20. Total tons, 16,277. Smelter treatment for the week was: Granby Co., 15,184 tons.

The seventh smelter in Nelson district, the Pilot Bay, has blown in its first furnace and two more will follow. Transport conditions are improving. The total shipment for last week was 32,023 tons and for the year 628,945. Boundary shipped 24,262 tons, Rossland 5,978, and Slocan-Kootenay 1,613 tons. The Slocan shipments were: St. Eugene 559, Sullivan 500, Hunter V. 146, Silver King 308, Krao 23, Queen 19, Payne 18, Keystone 14, Cliff 10, Noonday 11, and Midnight 5. The Boundary shippers were: Granby, Mother Lode, Brooklyn, Emma, Sunset, Rawhide, Skylark and Providence. The Rossland shippers were: Centre Star, Le Roi, Le Roi No. 2, and Jumbo.—Work is being resumed on several of the mines of Rossland, the Velvet-Portland, Crown Point, Jumbo and the White Bear being among them. There is report of the resumption of the Cliff and Idaho.—At the Trail smelter they are building a new lead furnace, and starting a fifth copper furnace, making a total capacity for the output of copper between 1,300 and 1,400 tons daily, and 350 to 400 tons of lead. The refinery is turning out 50 tons of lead daily, and shipping the greater portion to Canadian consumers. The refinery is being enlarged to a capacity of 75 tons per day. New cranes and a 500 h. p. generator are being installed. The plant for the Huntington-Heberlein process is being enlarged by the addition of six converters. New transformers for the increased consumption of power are being put in, and a new blower has been ordered.

ONTARIO.

The Dominion Gold Mining and Reduction Co.'s works comprising a stamp-mill, cyanide and chlorination plant valued at $30,000, were burned a few days since. The works were erected by Powers and Linn, American mining men, who obtained a bonus of $10,000 from the town. They sold them to a mining company in which local people were interested, who sold out to the Dominion Gold Mining and Reduction Works Co. The property had been idle for some time.

In a statement issued to stockholders the net profits of the Nipissing Mines Co., of Cobalt, are given as $1,024,628. After deducting $400,000 paid to stockholders there remains a surplus of $624,628. These results have been produced from surface ores taken from less than ten per cent of the properties. It is expected that during the coming year the production of these mines will exceed that of the past year. The company owns 900 acres of Crown patent lands in the Cobalt mining district.

MEXICO.

CHIHUAHUA.

The discovery of a new lead-silver district in Cerro de los Lamentos, 60 miles east of Ojo Caliente, is reported. The ore is said to occur in limestone, the geology resembling that at Santa Eulalia, but no porphyry has as yet been found. The district is dry, the nearest water being 12 miles, but a limited supply can be obtained from wells sunk in the neighboring valleys. The Porvenir de Sonora Mining Co. have commenced the construction of a mill of 200 tons daily capacity, at their El Rio mine, 16 miles east of Pozo station in Sonora. The plant includes rolls, Huntington mills, concentrators, and a cyanide leaching plant. Thirty-five miles east of Carbo, the new milling plant of the Giroux Consolidated Mining Co. is approaching completion. The new smelter at Oaxaca is expected to be completed and blown in during the fall. A branch railroad, connecting the smelter with the Mexican Southern railroad is under construction. C. A. Hamilton is general manager. A late report is to the effect that Mazatlan is to have a large smelter for custom ore. The smelter for the Green Gold-Silver Co., at Guaymas, is under construction. Its initial capacity will be 100 tons per day The Parral Power & Reduction Co., which has leased the Parral Milling Co.'s mill, is about to start up the plant. The Parral district's production for April was 17,890 tons. Of this about 13,680 tons were shipped to the smelters and 4,210 tons were treated locally.

Books Received.

Compressed Air: This useful monthly publication comes out under a new management, Mr. W. L. Saunders having given the business management to Mr. P. F. Kobbe, Jr., and while himself remaining editor, he has delegated part of his duties to Mr. W. R. Hulbert, who is known to our readers as a contributor on matters pertaining to the use of compressed air and electricity. The magazine has always been a useful one, and we are glad that Mr. Saunders' multifarious occupation as chief of the Ingersoll-Rand Company will still enable him to conduct this periodical, with the aid of such efficient assistance. The issue for May is a particularly good one.

Metallurgical Calculations, by Joseph W. Richards, A. C., Ph. D., of Lehigh University, is an authoritative work which cannot fail to immediately interest the metallurgical operator and student. It takes up the chemical, mechanical and metallurgical features of ore reduction, handling them in a rational and thorough manner. Rule of thumb methods in this work, give place to scientific calculations and practice. The chapter on blast furnaces and their operation; hot and cold blast; converting, etc., are particularly interesting. Some space is also devoted to electric furnaces, electrolytic furnaces and electrolytic refining. Another valuable feature of the work is that portion given to condensation of metallic vapors, which refers more particularly to the treatment of zinc and mercury. Sent to any address, by the Mining and Scientific Press, upon receipt of price, $2. McGraw Publishing Co., publishers, New York City.

Trade Treatises.

We are in receipt of a most attractive catalogue of locomotive cranes, buckets and tubs, published by the Wellman-Seaver-Morgan Co., of Cleveland, Ohio. This catalogue is splendidly illustrated on calendered paper, and contains much valuable matter on the subject.

The Colorado Iron Works Co.'s new catalogue No. 9-A illustrates and describes its latest pattern of Impact Screen, giving drawings that show setting plans usually adopted for installing a number of screens in a mill. These plans are intended to show the adaptability of this screen to any required arrangement.

P. B. McCabe & Co., of 602 North Main Street, Los Angeles, Cal., have issued an illustrated pamphlet descriptive of the New Standard concentrator, manufactured by them. This pamphlet is well illustrated, the engravings showing the concentrator from different positions. Details of construction and method of operating are given in full, so that anyone who knows anything about machinery may set up and run it.

Commercial Paragraphs.

American Tool Works state that they will be prepared to resume business after June 1, at 109 Mission St., San Francisco.

The Wellman-Seaver-Morgan Company's Pacific Coast office, formerly at San Francisco, is now temporarily located at 220 Twelfth St., Oakland.

Francis Smith & Co., manufacturers of steel and cast iron pipe, have their offices and works at Eighth and Townsend Sts., San Francisco. They are uinjured and ready for business.

The Sullivan Machinery Company announces to its customers that Randolph D. Talmage is appointed local manager at Joplin, Missouri, succeeding S. A. Allison, who is no longer connected with this company.

H. C. Baker, formerly in charge of the Atlanta Office territory of the Crocker-Wheeler Co., has started for San Francisco where he will take charge of the Pacific Coast territory of the Crocker-Wheeler Co. with temporary offices at 2611 Broadway.

In addition to the offices of Allis-Chalmers Co., recently established in Oakland, at 906 Broadway, this company has opened quarters in the Atlas Bdg., 602 Mission St., "New" San Francisco, where its representatives may be found in readiness to transact business.

The Rix Compressed Air Co., 1222 Franklin St., Oakland, Cal., is erecting a 150 h.p. Cincinnati gear, Laidlaw-Dunn-Gordon compressor for the Pennsylvania mine, Nevada City, and two 500 h.p. compressors, same make, belted independently, to 500 h.p. Stanley motors for pumping gas to San Francisco from Martin station of the California Gas & Electric Corporation.

Personals.

B. B. Thayer is at Butte.

J. Parke Channing is at Butte.

James D. Hague is at Berkeley.

Charles Butters has gone to Chicago.

H. W. Turner is at Cottage Grove, Oregon.

R. M. Raymond, manager of El Oro mine, is at New York.

Charles E. Chapin is now at 2810 Grant St., Berkeley.

James W. Malcolmson has returned to El Paso from London.

J. H. Mackenzie is at Seattle, arranging for an expedition into Alaska.

Theodore Dwight has returned to New York from Guanajuato, Mexico.

G. Bronson Rea, editor of 'The Far Eastern Review' is returning to Manila.

Auguste Mathez, who returned recently from Australia, is now at Denver.

Franklin R. Carpenter is at Tinton, South Dakota, examining tin properties

A. P. Rogers is now in New York, but will return to California for the summer.

Harold Rickard is at Manchester, England, where he is to be married on June 9.

John Treweek is superintendent of the Sunnyside mine, near Roosevelt, Idaho.

W. B. Dennis and C. E. Ladd, of Portland, have been at Oakland during the week.

Forest J. Swears has returned to California after three years in South America.

R. T. Bayliss, chairman of The Exploration Company, London, is on a visit to New York.

W. W. Wishon, of Los Angeles, is examining mines at Davis Flat, in Fresno county, California.

Henry Lyne is in England on a holiday, following his marriage to Miss Eleanor Pope, of Philadelphia.

Robert T. Hill has returned to New York from Mexico. He is expected at San Francisco next week.

Edwin E. Chase, on his return to Denver from professional work in California, has gone to Butte, Montana.

C. H. Doolittle has been in San Francisco to purchase machinery. He returned to Salt Lake City this week.

J. B. Baker, superintendent of the Standby mine at Rochford, South Dakota, has returned to the mine from Boston.

Robert Rhodes is manager of the Mammoth Smelter, of the United States Smelting, Mining & Refining Co., in Shasta county, California.

J. B. Tyrrell has been retained as mining engineer to the Canadian Northern Railway and his office will be with that company in Toronto.

William H. Leffingwell, whose office was on the sixth floor of the Kohl Bdg., was one of the very few who were not burnt out. His home also was safe, being at Berkeley.

Charles Rhodes, manager of the Waihi mine, New Zealand, has been on a visit to Berkeley, where his son has graduated from the University of California. He has gone to London.

Simonds & King, as explained elsewhere, have dissolved partnership. L. M. King will have an assay office at 1311 Franklin St., Oakland. E. H. Simonds will practise as metallurgical engineer at 2842 Hillegas Ave., Berkeley.

George W. Maynard has gone to Sonora in the interests of the Illinois Development Co., of Chicago, who are operating mines at El Plomo, Sonora. He is consulting engineer of the company and P. W. K. Robertson is the general manager.

The Geological Society of Washington held a special meeting on May 18 to discuss the San Francisco earthquake. Messrs. F. L. Ransome, George H. Ashley, Ralph Arnold, G. K. Gilbert, W. C. Mendenhall, L. A. Bauer, and M. L. Fuller read papers on the subject.

F. W. Bradley has his office at his new residence, 2661 Broadway, San Francisco. At the same address are J. H. Mackenzie, the Bunker Hill & Sullivan Mining Co., the Oriental Con. Mining Co., the Mariposa Commercial & Mining Co., and the Nevada Con. Copper Company.

The Inland Printer, of Chicago, has offered its employment exchange free of charge to those looking for positions pending readjustment and full resumption of business in San Francisco, and the pages of that useful paper will be open to listing the names of those seeking positions in the printing trade, who have suffered from the recent disaster. This is a practical and generous offer.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 10 Bacon Block, Oakland, has official reports of the following United States patents issued to Pacific Coast inventors:

818,652.—**Soap Bar**—T. M. Anderson, Bellingham, Wash.
818,812.—**Fruit Packer**—F. K. Bartholomew, Campbell, Cal.
818,860.—**Horizontal Cylinder Piston**—F. L. Bates, San Francisco, Cal.
818,608.—**Suspended Railroad**—G. W. Brower, Santa Monica, Cal.
818,742.—**Sleeping Car**—P. P. Carroll, Seattle, Wash.
818,872.—**Brooder**—L. W. Clark, Petaluma, Cal.
818,940.—**Saliva-Ejector**—H. S. Davis, San Francisco, Cal.
819,006.—**Wave Motor**—F. M. Dempsey, Vallejo, Cal.
818,880.—**Fishing Reel**—Ernst & Patton, San Francisco, Cal.
818,954.—**Rail Crossing**—O. Gottschalk, San Francisco, Cal.
818,883.—**Cattle Guard**—F. V. Grimes, Centralia, Wash.
818,955.—**Door Securer**—J. R. Hall, Moro, Ore.
818,958.—**Carpenter's Tool**—Hause & Marlin, Enumclaw, Wash.
818,889.—**Basement & Like Ventilator**—P. H. Jackson, San Francisco, Cal.
818,541.—**Heat Conserving Apparatus**—H. Lang, Oakland, Cal.
818,542.—**Opera Chair Hat Rack**—F. D. Lanterman Los Angeles, Cal.
818,770.—**Butter Cutter**—E. J. Luhman, San Francisco, Cal.
818,843.—**Tube Expanding & Beading Tool**—W. McCormick, Hillyard, Cal.
818,776.—**Sand Blast Apparatus**—J. D. Murray, San Francisco, Cal.
818,550.—**Table**—S. A. Nichols, Los Angeles, Cal.
818,906.—**Measuring Instrument**—V. J. O'Connor, Bend, Ore.
818,552.—**Fruit Clipper**—H. H. Petty, Pomona, Cal.
819,024.—**Lock**—B. Phelps, Seattle, Wash.
818,559.—**Trace Buckle**—O. Rampendahl, St. Helena, Cal.
818,792.—**Attachment for Teams**—T. Schmieser, Davisville, Cal.
818,794.—**Pile & Like Clamp**—P. Sheridan, Berkeley, Cal.
818,799.—**Planter**—J. N. Taylor, Toluca, Cal.
818,930.—**Harness**—E. H. Yule, San Francisco, Cal.
819,967.—**Fender**—M. S. Aisbitt, Los Angeles, Cal.
819,969.—**Folding Furniture**—W. N. Anderson, San Rafael, Cal.
820,332.—**Irrigation Dam**—A. W. Applegate, Brawley, Cal.
819,838.—**Animal Trap**—P. Armstrong, Shelton, Wash.
820,336.—**School Furniture**—A. L. & G. H. Bancroft, Los Angeles, Cal.
819,843.—**Grading and Excavating Machine** — S. H. Bloomer, Seattle, Wash.
820,282.—**Electric Water Heater**—W. A. Brown, Oakland, Cal.
820,093.—**Bottle**—L. A. Calhoun, Oceanpark, Cal.
819,724.—**Rotary Engine**—A. H. Carpenter, Stockton, Cal.
820,097.—**Water Gate**—A. J. Collar, Yreka, Cal.
819,854.—**Sash Bar**—J. P. Comstock, Tacoma, Wash.
820,288.—**Briquetting Machine**—C. Demetrak, San Francisco, Cal.
820,101.—**Underreamer**—E. Double, Los Angeles, Cal.
819,986.—**Pump for Wells**—A. N. Ellis, San Bernardino, Cal.
819,747.—**Rotary Engine**—A. F. Ford, Colfax, Wash.
819,752.—**Steam Motor**—L. Gilmore, Jr., Colfax, Cal.
819,758.—**Rope Machine**—E. F. Hug, Elgin, Ore.
820,118.—**Amusement Apparatus**—F. J. Johnston, Sacramento, Cal.
820,203.—**Trousers Form**—Alice Jones, Dehesa, Cal.
819,775.—**Stove**—N. D. Loughery, Los Angeles, Cal.
819,902.—**Lock Nut**—W. C. Matteson, Stockton, Cal.
820,063.—**Selective Telephone System**—McKinsey & Nelson, Susanville, Cal.
820,064—**Selective Phone**—McKinsey & Nelson, Susanville, Cal.
820,006.—**Dumping Car**—A. Mieden, Seattle, Wash.
820,007.—**Pneumatic Cleanser**—A. E. Moorehead, Oakland, Cal.
820,122.—**Power Transmission**—Morrice & Grim, Sonora, Cal.
820,312.—**Saw Guide**—J. H. Perkins, Seattle, Wash.
819,925.—**Bale-tie Machine**—A. E .Rhoades, Elk Grove, Cal.

Temporary Addresses of San Francisco Firms and Professional Men.

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ALLIS-CHALMERS CO., 906 Broadway, Oakland, and Atlas Bdg., 602 Mission St., San Francisco.
AMERICAN TOOL WORKS, 4153 20th St., San Francisco.
ASBESTOS MFG. & SUPPLY CO., 1834 Ashby Ave., Berkeley.
BAKER & HAMILTON, 113 Berry St., San Francisco.
BALFOUR, GUTHRIE CO., 714 Broadway, Oakland.
BARNHART & SWASEY, 878 Broadway, Oakland.
BOESCH LAMP CO., 1569 Grove St., San Francisco.
BOSQUI, F. L., Ross, California.
BRADLEY, F. W., 2661 Broadway, San Francisco.
F. W. BRAUN & CO., 2513 24th St., San Francisco.
BROWN, R. GILMAN, Sturgis Warehouse, 2031 Sutter St., San Francisco.
BROWNELL, J. S., 29 Jordan Ave., San Francisco.
BURCH, A., Cosmos Club, San Francisco.
BUTTERS, CHAS., 4 Bacon Block, Oakland.
BYRON JACKSON MACH. WORKS, 18 Telegraph Ave., Oakland.
CALIFORNIA PERF. SCREEN CO., 1300 Arch St., Berkeley.
CALIFORNIA HYD. ENG. & SUPPLY CO., 1169 Jefferson St., Oakland.
CALIFORNIA ORE TESTING WORKS, 364 Bay St., San Francisco.
CHAPIN, CHAS. E., 2810 Grant St., Berkeley.
CHROME STEEL WORKS, 1736 Walnut St., Berkeley.
COMPRESSED AIR MACH. CO., 415 Fillmore St., San Francisco.
DENNISTON'S S. F. PLATING WORKS, 3454 21st St., San Francisco.
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EVANS, GEORGE H., Regent St., Fairview Park, Oakland.
FAIRBANKS, MORSE & CO., 969 Broadway, Oakland.
FALKENAU ASSAYING CO., Polytechnic Business College, Cor. 12th and Harrison, Oakland.
FORBES, JOHN F., 601 Kohl Bdg., San Francisco.
W. P. FULLER & CO., 412 12th St., San Francisco.
FULTON IRON WORKS, Harbor View, San Francisco.
W. T. GARRATT & CO., 2398 Broadway, San Francisco.
GOODYEAR RUBBER CO., 2600 Pacific Ave., San Francisco.
GUTTA PERCHA & RUBBER MFG. CO., 402 High St., Alameda.
GWIN MINE DEVELOPMENT CO., 1801 Central Ave., Alameda.
JOSHUA HENDY MACHINE WORKS, Bay and Kearny St., San Francisco, and Room 41, 906 Broadway, Oakland.
HARRON, RICKARD & McCONE, 2nd and Clay Sts., Oakland; 7th and Berry Sts., San Francisco.
HARMON LUMBER CO., S. H., 1st and Brannan Sts., San Francisco; 1921 Fillmore St., San Francisco.
HEALD'S BUSINESS COLLEGE, 1451 Franklin St., San Francisco.
HENSHAW, BULKLEY & CO., 1010½ Washington St., Oakland.
J. C. HOWLETT MACHINE WORKS, 1014 Buena Vista Ave., Alameda.
HOFFMAN, ROSS B., 566 31st St., Oakland.
HOLMES, GEO. L., 143 Santa Clara Ave., Oakland.
HUNT, BERTRAM, H. F. Eckert, 750 59th St., Oakland.
JANIN, STEBBINS & SMITH, McDonald Bdg., Oakland.
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MacKENZIE, T. H., 2661 Broadway, San Francisco.
McMASTER, D. J., 512 Folsom St., San Francisco.
MEESE & GOTFRIED CO., 1332 McAllister St., San Francisco.
A. MERLE & CO., Bay and Stockton Sts., San Francisco.
MOORE & SCOTT IRON WORKS, 412 Main St, San Francisco.
MOUNTAIN COPPER CO., 1020 14th St., Oakland.
CHAS. C. MOORE & CO., 417 14th St., Oakland.
GEO. W. MYERS, 1736 Walnut St., Berkeley.
R. N. NASON & CO., 15th and Utah Sts., San Francisco.
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NOYES, W. S., Room 25, Albany Block, Oakland.
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RIX COMPRESSED AIR & DRILL CO., 1222 Franklin St., Oakland.
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SAN FRANCISCO BRIDGE CO., Ft. of Walnut St., Oakland.
SIMONDS & KING, 1605 Walnut St., Alameda.
SMITH, EMERY & CO., 1104 Broadway, Oakland.
SMITH & CO., FRANCIS, 8th and Townsend Sts., San Francisco.
UNITED IRON WORKS, 2nd St., Oakland.
UNITED STATES CAST IRON PIPE AND FOUNDRY CO., 951 Eddy St., San Francisco.
UNION GAS ENGINE CO., 23rd Ave., Alameda.
VULCAN IRON WORKS, 1259 McAllister St., San Francisco.
VAN DER NAILLEN, A., 5182 Telegraph Ave., Oakland.
WESTERN MACHINERY CO., 230 Main St., San Francisco.
WESTERN FUEL CO., 340 Steuart St., San Francisco.
WESTINGHOUSE ELECTRIC & MFG. CO., 1115 Broadway, Oakland, and 2nd and Howard Sts., San Francisco.
H. S. WHITE MACHINERY CO., 9th and Bryant Sts., San Francisco.
GEO. E. WOODBURY, 1360 Webster St., San Francisco.
WESTERN GAS ENGINE CO., 547 Fulton St., San Francisco; cor. 3rd and Washington Sts., Oakland.

There are about 500,000 tons of mill-tailing lying near the bank of the Carson river, and east of the mouth of the Sutro tunnel, in Nevada, discharged from some of the mills which treated Comstock ore. This tailing is said to average $3 in gold and silver, but it also contains a large amount of mercury, partly native, and, probably, partly as chloride; copper sulphate, sodium chloride, silica, calcium carbonate, calcium sulphate, iron oxide and several other minerals, either native to the ore, or added in the milling operations. Numerous attempts have been made to treat this tailing by cyanide and otherwise, but the chemical and mechanical difficulties to be overcome have rendered it a somewhat uninviting commercial proposition.

Latest Market Reports.

Anglo-American Shares.

Cabled from London.

	May 17 £ s d	May 24. £ s d
Camp Bird	1 2 10½	1 2 6
El Oro	1 6 9	1 8 9
Esperanza	3 15 0	3 16 3
Dolores	1 18 9	1 17 6
Oroville Dredging	0 17 0	0 17 0
Stratton's Independence	0 7 0	0 6 6
Tomboy	1 6 3	1 7 6

(By courtesy of W. P. Bonbright & Co., New York.)

METAL PRICES

By wire from New York.

Average prices for week ending:

	May 17.	May 24.
Lake	$18.62@$18.80	$18.62@$18.87
Electrolytic	$18.30@$18.55	$18.37@$18.62
Casting	$18.12@$18.25	$18.12@$18.25
Lead	$ 5.70	$ 5.75
Spelter	$ 6.00	$ 5.90@$ 5.95
Silver	$ 0.66⅝	$ 0.68

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EDITORIAL.

MAIL ADVICES from South Africa indicate that March was a splendid month in the history of the gold industry of the Rand. The output was 443,723 fine ounces valued at £1,884,815 or $9,141,352, exceeding the best previous monthly record by £51,500. There were 7,025 stamps at work on the Rand and 7,460 in the whole Transvaal. Among the laborers there were 78,676 Kaffirs and 49,877 Chinese. A notable increase in stamp-duty at several of the mills is credited to the use of tube-mills. The highest profit per ton earned on the Rand was 36 shillings, to be credited to the Robinson Central Deep mine. Nine dollars per ton is a handsome profit anywhere. In this case the working costs were 16s. 5d., say, $4 per ton. Therefore the ratio of profit was nearly 70 per cent.

OUR MELBOURNE CORRESPONDENT refers to a matter that calls for further comment. It appears that the firm of Bewick, Moreing & Co. is said to have antagonized labor in Australia and that for this reason the mines they control are in danger of incendiarism. We do not believe such a slander on the great Commonwealth of the antipodes and we trust that should it be even remotely possible, the authorities will realize the importance of thwarting such acts of criminal lunatics. When people are enterprising and independent they are apt to meet opposition, some of which may not be according to Hoyle, but we trust that those who have at heart the best interests of Australia will aid a firm so conspicuous for the stimulus it has given to the mining industry of the island continent.

OUR CONTEMPORARY at Johannesburg, *The South African Mines,* is waging a lively campaign against the labor system on the Rand and appears to have made good its assertions that a supply of efficient miners is lacking; that the wages of miners—both the good and the indifferent—are extraordinarily high; that labor, whether white or black, is wasted; that the supervision of mines is often incompetent and that mine managers are not encouraged to deal severely with these shortcomings. Many of these objectionable features are due to the high cost of living and the unhealthiness of work underground at Johannesburg. The cost of living is high because the administration is elaborate, railroad rates are excessive and supplies come from a great distance. Underground the conditions are unhealthy because of the dryness of the mines and the formation of sharp particles of quartz-dust injurious to the lungs. Centralization of management covering big groups of mines has tended to kill personal initiative and submerge the individual under the machine. We wish our contemporary success in its spirited campaign.

TO FLEE FROM EARTHQUAKES is about as philosophic as to try to dodge a thunderbolt and therefore we are not surprised that our immediate neighbors are so willing to remain in California. On another page we quote the observations of an authority upon British earthquakes, indicating that even the little islands set in the silver sea are subject to these disturbances. It has been said—on this side—that it needs an earthquake to perturb the stolidity of the British character, and obviously Nature is not unmindful of her duty. Here, in California, we realize that an occasional tremor is a small price to pay for a beauty of climate and a glory of sunshine that make life worth living indeed. In this connection we quote a brilliant young geologist at Washington who recently discussed the earthquake of April 18 in a scientific publication and was criticized for prognosticating further departures from California serenity. He says that he did "not predict bigger quakes but merely pointed out, what any intelligent man must realize, that earthquake probabilities in the future must be calculated from the data of the past. The recent great shock has probably relieved a strain that may have been 50 or 100 years in accumulating and which may be a century or more in again assuming dangerous proportions. Personally, I should be glad to take my chances in California, preferring the risk of the occasional earthquake to the inevitable visitation of our Eastern summer heat." All of which appeals to us as being true, so we expect to see our friends coming to California as of yore, to get rest, to obtain sunshine and to look upon the face of Nature where she is young and beautiful.

THE BOARD OF GOVERNORS of the New York Stock Exchange has passed a resolution stating that anyone having any sort of connection, or doing any business, with the Wall Street Mining & Stock Exchange "is guilty of an act or acts detrimental to the interests or welfare of this Exchange and any connection is hereby prohibited." All of which is impressive, but mistaken. It serves chiefly to emphasize the fact that the new exchange, largely devoted to the mining market, is doing an excellent business, for the price of membership has risen steadily of late, until it has reached $250, and of this we are glad, simply because the big Exchange has ignored mining. There are only two or three mining stocks quoted and of these Amalgamated, Anaconda and Homestake are all blind pools of an obviously dangerous kind, not one of which ought to be listed without disciplinary measures. At present mining shares are handled on the Curb—a peripatetic and rather absurd institution that divides a part of Broad Street with the cabs and lunch-wagons of the financial focus. Surely it is time that New York had a dignified and properly accredited mining exchange, either as a part of the Stock Exchange or as a separate institution. Whether the Wall Street Mining & Stock Exchange meets all the requirements, we do not know; but it appears to be a sincere endeavor to establish a mining mart.

METALLURGICAL DEVELOPMENT on the Rand rolls forward on tube-mills, and we are glad to be able to publish an important review of the subject by such energetic and capable engineers as the brothers Denny. They certainly exhibit a commendable example of proper professional spirit, for not only do they give frankly the results of several years of painstaking observation, but they also invite other metallurgists to visit the works under their charge and take such samples as may be required to check the stated figures of extraction. Messrs. George A. and Henry S. Denny have had to break trail in a metallurgical way, for they have been the pioneers in the introduction of tube-mills on the Rand, and they deserve credit for this initiative. It was prognosticated by them in July, 1903, that an addition to stamp-duty and an increase in extraction would follow the introduction of these re-grinding machines and now, nearly three years later, these statements have been made good. But it is the principle, rather than the particular device, that they advocated then, as they do today. Therefore it is interesting to note that they favor a trial with the grinding pan which has been successful at Kalgoorlie. Elsewhere the choice of machine will depend upon the character of the particular ore. At the Waihi mine, in New Zealand, the tube-mill has proved especially adapted

to fine grinding, so also at Goldfield, in Nevada, and El Oro, in Mexico. In regard to the filter-press which has been developed in connection with recent re-grinding methods, it appears that on the Rand the first experiments, made several years ago at the Robinson mine, provoked a discussion, the result of which was to condemn the use of this machine in that locality. In the case cited, at the Meyer & Charlton mine, the slime is not filter-pressed, the cyanide solution circulating right through the whole plant, as described by the Messrs. Denny. In the full paper some peculiar features affecting the precipitation of the gold on zinc-shaving are described, among them being the results from very weak solutions; it is also shown that the supposed bugbear of an abnormal amount of copper or zinc in the circulating solution is non-existent. The article we publish is an abstract; the full paper will be available in a couple of months.

Wrong Estimates.

Reports from mines often chronicle the agreeable fact that the ore is wider or richer than was stated in the original report on which the property was taken over by the company. The engineer who made the investigation for the buyer will write with pride that his moderate statements have proved below the mark. For instance, in the excellent report of the Dolores company, quoted by our London correspondent, it is stated that the stoping widths are greater by several feet than those given in the original valuation of the mine, and even the ore in the old dumps is richer than was stated at the time. This illustrates a curious—and it appears to us, mistaken—notion, prevalent in the mining community. It is not recognized as it should be, that under-estimates are no more laudable than over-estimates; the engineer's aim should be accuracy. As a matter of fact the best estimate is a careful approximation, and whether the margin of variation be above or below the truth, matters not at all—from an engineering standpoint, however variable the effect on the business of the mine promoter and speculator. For instance, the Dolores mine has turned out exceptionally well; it was examined by four mining engineers of the highest standing; their estimates differed and it is fair to say that the engineers who represented the purchasers gave the lowest estimates, and as these gentlemen had large financial backing, the other engineers who reported on the mine for the vendor, were placed in the position apparently of having drawn a long bow. They were all first-rate men so that no destructive criticism was ventured, but it is an amusing fact that the vendor's engineers were placed on the defensive. There was no more reason for this, than that the engineers who represented the other side should be regarded with suspicion. And now the purchasing company, through its consulting engineer and its directors, pats itself on the back for finding more ore than it paid for. The matter has both a humorous and a serious side. The humor is obvious; the bad effect on professional integrity is worthy of emphasis. It is not directly in question in this particular case, for we have no reason whatever to believe that there was any wrong-doing—that is, under-estimation of ore from bad motives—but, indirectly, the episode illustrates a wholly mistaken idea that an engineer is warranted in understating the value of a mine in order that his client may buy cheaply. That is misrepresentation, call it by any more pleasant name that you please, and it is unprofessional, if anything in the world is. An engineer who finds $1,000,000 of net profit to be won from the ore in a mine and states it at $750,000 in order to safeguard his reputation or to permit of a safe purchase by his client, is not one little bit nearer right than the other who, to help out a deal, states it at $1,250,000. Mining engineering is the application of science to mining, and science knows no such little tricks as making two and two into three, any more than into five. It is worth while to speak of this matter, for it has cropped up several times in recent years and has endangered the reputation of the profession before the public, more especially those who speculate in mines. We hold that an engineer who examines and reports on a mine should conduct himself as if he were appointed by a Court to appraise its value as between buyer and seller. It should make no difference which side engages him, his professional integrity ought to be as superior to the influence intended to affect his judgment, as it is superior to coarse bribery. This may be ideal, but perfect independence is always ideal—though none the less worthy of effort. It is our firm conviction that when the profession accepts this point of view, there will be more confidence in the judgment of its individual members and the public will be able better to distinguish between the professional man, who is to be trusted, and the financier, who has his own game to play.

The Home of the Survey.

Among the bills before Congress is one introduced in the Senate by Mr. Frank P. Flint, of California, and in the House of Representatives by Mr. James S. Sherman, of New York, the object of which is to provide a new building for the United States Geological Survey. We trust this bill will be passed, for it embodies the fulfillment of a pressing need. Those who have visited their friends on the Survey at their quarters in Washington are familiar with the crowded space and old-fashioned arrangement of the building that they occupy. The bureau gives permanent employment to 1,000 persons, and temporary field employment to nearly as many more. Of this total force about 600 men are engaged at times, and during all of every winter, on office work at Washington. The total floor-space available is only 105,670 square feet. Even the corridors are utilized for desks and map-cases. All engineers know how difficult it is to carry on drafting, compilation, and statistical work within narrow confines and how great a handicap it is to scientific men to use microscopes, examine mineral specimens and make chemical or physical researches in a poorly lighted room. Furthermore, the present building is so constructed that any delicate apparatus is affected by vibrations caused by the printing presses in an annex and at least twenty-five rooms in the main building are so dark as to require artificial lighting. The records stored within the present structure are worth $6,000,000 and as the building contains about 100,000 square feet of wooden partitions, it is obvious that there exists great danger from fire. Many of the records thus flimsily sheltered could not be replaced. It is desired to erect a modern building with a net available space of at least 150,000 square feet, exclusive of basement and halls; the cost would be $1,200,000, while the rental paid at present is $34,000 per annum, or nearly three per cent on the contemplated expenditure. We hope to see it duly authorized. The mining community is not without proper recognition for the splendid work done by the Survey, and while we have ventured more than once to criticize certain weak features in its administration during recent years, we take pleasure in emphasizing the urgent need for facilities such as are required for the comfort of its scientific corps and the preservation of its invaluable archives.

By the Way.

In a recent issue of 'The Nineteenth Century,' there is an interesting article on 'Earthquakes in Great Britain.' We quote a portion of it:

At places near the center of disturbance, the first sign of the coming earthquake is a low sound like the sudden rising of the wind. Almost immediately a faint trembling begins, such as is felt on a railway platform when an express train rushes by. Rapidly this increases in strength, the sound becomes louder, more rumbling and grating in character, and resembling that produced by the rapid passage of a traction-engine or a heavy motor-car. It is a sound so deep as almost to be more felt than heard. Then, after the lapse of four or five seconds from the start, the tremors merge into sharp rapid vibrations, accompanied by loud explosive crashes in the midst of the rumbling sound. These may last for two or three seconds, after which the vibrations shade off again into tremors, the sound becomes a mere rumbling and finally all movement ceases, the sound dying away as a low monotonous groan like the last roll of very distant thunder. Farther away, at distances of from 50 to 100 miles from the center, the phenomena are much simpler. There is no change in the nature of the sound, which merely increases in strength with the tremor, and then both die away together. The movement is, however, less rapid and jolting, and more like that felt in a carriage with good springs traveling over an uneven road.

Nineteen out of every twenty earthquakes in this country are fairly represented by the above descriptions. The remaining earthquakes are somewhat more complex. The shock consists of two distinct parts separated by an interval of two or three seconds, each part being similar to the shock of a simple earthquake. In some, the two parts are connected at places near the center by a weak tremulous motion, which, at a short distance, becomes imperceptible; in others, the interval between the two parts is everywhere one of absolute rest and quiet. The parts generally differ slightly in duration and intensity, and occasionally in the nature of their vibrations. To earthquakes of this class, the name of 'twin' has been given, because, as will be seen, the double shock is due to two distinct impulses resulting from a single generative effort.

The strongest earthquakes in this country are just capable of producing slight damage to buildings. Others are strong enough to overthrow ornaments and vases, or to make pictures and chandeliers swing, to give a perceptible movement to the observer's seat, to make doors, windows, etc., rattle, or, finally, to be just perceptible to a person at rest. The waves of any earthquake, as they radiate outward from the origin, pass gradually through these different degrees of intensity. Knowing the degree at a large number of places, it is possible to draw on the map of an earthquake a series of isoseismal lines, or lines of equal intensity. Rough though this scale of intensity may be, it would be difficult to over-estimate the service which it has rendered in the investigation of earthquakes.

In any earthquake, the outer isoseismal lines are nearly circular in form, while the inner curves are elongated (approximately in the same direction), the innermost curve of all being as a rule the most elongated. It is, however, when considered in connection with the geological structure of the districts that the significance of these elongated isoseismal lines becomes apparent. Their longer axes are then found to be parallel, or nearly so, to the axes of the great crust-folds of the underlying rocks. The initiation of these folds dates from long-past geological ages, and their formation has proceeded slowly and gradually ever since. In close connection with the folds, however, are nearly parallel and perpendicular systems of faults or fractures, along which movement takes place intermittently, the crust on one side advancing over that on the other by a series of slips, rather than by imperceptible creeps. When we consider that these faults are often many miles in length (two, for instance, cross the whole of Scotland), and that the total displacement may amount to thousands of feet, even to miles, when we think, further, that in each individual slip the crust may not advance by more than a fraction of an inch, though it may be by several feet, we can realize, though but dimly, the enormous number of displacements that must contribute to the growth of a great fault. At the same time, if we consider the mass of the rock that may be subjected to one of these slips and the friction that must thus suddenly be brought into action, we can understand how the resulting vibration would produce a shock that may be as weak as the faintest tremor felt at Comrie, or, on the other hand, as mighty as one of the great convulsions that have devastated Lisbon or Calabria, or ruined the coasts of Chili and Japan.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

It is customary to lay T rails in mines with the joints between ties, and not upon them. The rails wear more evenly when this is done.

There are four types of flume construction: The V type, the rectangular, the vertical side with inclined bottom, and the semi-cylinder. The latter is usually made of half-round steel sections.

The lessee of a mine has a right to all of value that may be in the dump created by his mining operations, unless the lease stipulates otherwise, but the right ceases upon the termination of his lease.

Nickel of high purity—99.2 per cent—is produced by electro-chemical methods, but there is no demand for nickel of such purity in competition with the metal produced by other and less expensive methods.

The pressure of water is equal in all directions. On the face of a dam the direction of pressure at any point is normal to the face of the dam at that point. If the face of the dam be vertical, the pressure of the water on its inner face is horizontally outward.

Where tailing or dump-rock is left on the land of another, this detritus of mining operations becomes the property of the landowner, who may convert it to his own use if he so desires, or he may sue the owner of the mine or mill producing it for damage, if any result to him.

Wrought iron, not only because of its freedom from manganese, but because of its very defect of being laminated by the presence of cinder, is more ductile than mild steel under certain special conditions of use, such as for rivets and horseshoe nails, many of which are made from it.

The occurrence of fluorite in ore is not indicative of the presence of telluride of gold, but rather incidental to it, as in the Cripple Creek district of Colorado, and in lesser amount in the Black Hills of South Dakota. Fluorite is of frequent occurrence in lead and zinc mines where no tellurides are known to exist.

The principal objection to the general introduction of the metric system comes from manufacturers, who claim its adoption would necessitate changes in all existing gauges and standards of measurement in America and England, particularly in sizes of steel and iron plates, bars, wires, etc., and in the standardized tools employed in their use.

The compression of air always develops heat, so much so in fact, that, if a mass of air is compressed to one-fourth of its original volume, its temperature will be raised to 376° F. if no heat is allowed to escape. Since the air, thus compressed, is allowed to cool down to the temperature of the surrounding atmosphere before it is used, the mechanical equivalent of this dissipated heat is work lost.

Concerning the life of a wire rope on an aerial tramway: In one instance a new rope lasted but three months. It was replaced by another first-class steel rope which has now been in continuous use for three years and is apparently still in good condition. In another case, a rope carried 1000 tons daily during a shift of seven hours and was worn out at the end of fifteen months.

Free gold often occurs in the foils of mica schist, particularly when silicious and of a dark purplish-brown color; but deposits of this sort are usually merely zones of mineralization which are limited in both horizontal and downward extent. Well-defined veins in mica schist are as likely to be permanent, however, as those occurring in any other formation, particularly when the vein occupies a well-defined fissure cutting across the schist.

The California courts have held that in case of a cross-lode location the junior locator may pass through the ground of the senior locator, but must turn over to the senior locator all the ore removed within the vertical planes determined by the latter's claim-lines. Those portions of the junior locator's claim lying outside the boundaries of the senior claim may be worked by the junior locator without interference from the senior locator.

As a material for making the better classes of tool-steel, by re-melting, by the crucible process, wrought iron is preferred to mild steel both because it can be made freer from certain elements, especially manganese, which are here undesirable, and because the crucible steel made from it is, in the opinion of the best judges, better than that made from mild steel, even if of like composition, though why this is so has not been convincingly explained.

The initial step in the development of the electro-chemical and electro-metallurgical industries was the refining of copper electrolytically. These branches of scientific industry have grown rapidly during the past decade. Electrolysis is now employed in the manufacture of metallic sodium, caustic soda, sodium peroxide, bleaching powder, zinc chloride, cyanide and other salts of the metals. The manufacture of aluminum has grown into a large industry both in the United States and in Europe.

There are nearly seventy establishments in the United States, Italy and France producing calcium carbide, the aggregate output being 90,000 tons annually. Both the output and consumption of this material is increasing. Acetylene lamps are both useful and satisfactory in mines. No class of portable light is better for shaft inspection or for the examination of high backs in stopes, caved workings, and other places beyond the range of ordinary lights such as are usually employed in mines.

Felsite is generally ashy gray in color, but is also occasionally brown, reddish, green and even black, due to the occurrence of innumerable dark colored inclusions. It occurs from small veins up to great mountain masses, and zones of fracture in the rock are often found to have been mineralized sufficiently to constitute ore deposits of commercial value. Felsite is often difficult to distinguish from rhyolite, much of which it resembles in physical appearance.

The greater number of ore deposits and veins occurring in the Great Basin region are found in igneous rocks, both intrusive and volcanic. These include the older diorite, diabase, quartz-porphyry, granite, etc., and the andesite, rhyolite, trachyte, and some less common effusive rock types. Ore deposits are also found in the sedimentaries, particularly limestone and quartzite, but usually at or near the contact of these sedimentaries with intrusive dikes and masses.

Corundum is the hardest known mineral next to the diamond, being nine in the scale of hardness, in which quartz is seven and the diamond ten. Different crystals and pieces of corundum vary somewhat in hardness, though only slightly. The blue sapphire is the hardest, the ruby being a little softer. Emery is a granular corundum, in which the grains are mixed with magnetite or hematite. In size the grains of corundum vary from those too small to be distinguished to those which may be plainly seen. Emery has a metallic to submetallic luster, clean corundum being adamantine.

Cinnabar occurs in a great many places in California, but comparatively few of these occurrences are of commercial importance. The greater number of these are in the Coast range region, but there are several localities in the foot-hills of the Sierra Nevada the most noted being near Latrobe, in El Dorado county. Another occurrence is known near Horseshoe Bend in Mariposa county, in association with gold in a quartz vein. A small amount of cinnabar is found with hematite about two miles from Copper Basin, 13 miles southwest of Prescott, Yavapai county, Arizona. It is not worked and but little developed.

The rate of increase of production of the iron blast-furnace has been extraordinary. In 1863 a daily production of 50 tons per furnace, and, in 1880, one of 115 tons was unusually large; but in 1898 one of the Duquesne furnaces made 711 tons per day, and the four furnaces of the plant were making regularly 2,200 to 2,300 tons daily, a rate half as great as that of the United States furnaces collectively in 1870. Ohio No. 2 furnace at Youngstown, Ohio, has made 806 tons of bessemer-pig iron in 24 hours. The increase since 1880 has been brought about—not chiefly by the use of larger furnaces (although the hearth is made wider than formerly), but by providing very powerful engines and hot-blast stoves, and it has almost forced the adoption of automatic methods for handling rapidly both the raw material, the cinder, and the pig metal of the furnace.

The recent eruption of Mount Vesuvius has attracted the attention of the entire world, but as stupendous as it was, Vesuvius is a volcano of the second, or even third class, as compared with the great volcanoes of the Pacific coast, active, dormant and extinct. There are a score of volcanic cones in the region included in the Shasta and Lassen Peak section of California, rivaling Vesuvius in magnitude, while Shasta and Lassen are of comparatively prodigious size. The most recent volcanic eruptions in California are those of Inskip Hill, near Payne creek, Tehama county, and the cinder cone ten miles east of Lassen peak in Shasta county. At the latter place, pine trees are still standing in the ashes which fell about the vent, indicating the recent date of this eruption.

Where quartz lenses occur in mica schist, they follow a definite strike, usually at a slight angle to that of the formation. Frequently these lenses overlap at their ends, the distance between them generally having a direct relation to the size of the successive deposits, the distances being roughly proportional to the size of the individual lenses of quartz. That is, where the several successive lenses are large, the distance between them is greater than where the lenses are small. Both the large and small lenses are produced by similar causes, the amount of the stress usually determining the extent of the crumpling of the schists, which in turn pre-determines the size, but not necessarily the richness of the ore-shoot.

Lime is calcium oxide. In nature calcium occurs most commonly as carbonate (calcite) or as sulphate (gypsum). Calcite is crystallized calcium carbonate. Before the blowpipe it becomes calcium oxide, and does not crumble. Aragonite is also crystallized calcium carbonate, but crumbles before the blowpipe flame. Common limestone is calcium carbonate, and effervesces in cold hydrochloric acid. Much marble is dolomite. Dolomitic limestone effervesces slightly or not at all in cold hydrochloric acid, but readily if the acid be heated. The mineral should be pulverized. Limestone treated with hydrochloric acid forms calcium chloride. On the addition of sulphuric acid, calcium sulphate is precipitated.

If it costs $4 to smelt a ton of self-fluxing ore worth $8 per ton f. o. b. at the smelting works, we have a profit of $4 per ton. If the ore needs, for example, one-fourth ton of iron ore and one-fourth ton of limestone (as may be calculated beforehand) then the returns would be as follows:

Smelting 1½ tons material of the charge..	$6.00
¼ ton iron ore @ $4.....	1.00
¼ ton limestone @ $1.....	.25
Total cost	$7.25

Leaving but 75c per ton profit to the works treating such an ore—to say nothing of losses in the slag and as flue-dust—this would give a narrow margin indeed! Figured on the same basis for a silicious ore, needing one ton each of iron ore and limestone to the ton of ore, we shall find the total cost to figure out $17 and, at the same time, the works would put through but one-third as much ore as if it had been self-fluxing.

Until lately, the cast iron for the bessemer process has nearly always been allowed to solidify in pigs, which were next broken by manual labor and re-melted at great cost. It has long been seen that there should be a great saving if this re-melting could be avoided and the 'direct metal,' that is, the molten cast iron direct from the blast furnace, be treated by the bessemer process. The obstacle is, that, owing to unavoidable irregularities in the blast-furnace process, the silicon and sulphur of the cast iron vary to a degree and with an abruptness the bessemer process can hardly tolerate. To ensure the constant quality of the cast iron thus to be used, Capt. W. R. Jones invented the mixer first put into operation at the Carnegie Steel Works. This is simply a great reservoir like a reverberatory furnace into which successive lots of molten cast iron from all the available blast-furnaces is poured, forming a great molten mass of 200 or more tons. This is kept molten by a small flame playing over it. The successive lots of cast iron, thus mixed and arranged, are drawn off, as they are needed, for conversion into steel at the converter. This device not only makes the cast iron much more uniform, but also, by a curious reaction, removes much of the last traces of contained sulphur.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

SOME PRACTICAL HINTS.

The Editor:

Sir—The man whose business brings him in contact with actual mining operations, whether in the capacity of mining engineer, manager, superintendent, or surveyor, or even a casual visitor, cannot fail to note the various methods of construction and maintenance of the main openings.

If the mine is worked through an adit (I prefer the word 'adit' to 'tunnel' and believe it is the better term for an underground opening that has but one end at the surface) the first thing a practical miner notices is the timbering, if any, and the condition of the track, footway and water-ditch. It is not unusual to find such an opening timbered in the most nondescript manner, the sets placed at irregular distances from each other and no two in line, giving one the impression that the timbers are framed and set to conform to the ground instead of taking out the ground necessary to allow of timbers of a uniform size and length being placed in line with each other. It may be well to state here that the operations of our large companies, driving big openings in a well-ordered, systematic manner do not come within the purview of this article.

The reason, no doubt that so many adits are tortuous and crooked, is the fact that many of them were originally driven by poor prospectors who, without adequate funds at their disposal and working under extremely adverse conditions, were compelled to sacrifice symmetry of detail in their effort to force the opening ahead as quickly and cheaply as possible. Then, too, in driving a prospect adit it is only natural for a man to follow the line of least resistance, which policy is bound to cause him to avoid a hard 'knuck' on one side and work the softer material on the other, should it exist there. Another, and perhaps a more potent reason for crooked openings is that where the work is done on the vein itself (and that is the place for a prospector to do it generally), the windings and turnings of the vein will determine the course of the drift. It is generally the practice to follow along one of the walls or both, if the width of the vein will admit of it. It is easy, therefore, to see why the original prospector's drift is such a crooked, irregular passage but I cannot see any reason whatever for the manner in which many of our regular operators construct their main drifts and cross-cuts.

It is about as easy, under usual conditions, to drive a drift right as wrong and the latter makes for a great increased cost in subsequent operation and maintenance. Let us now try and prove this. Imagine an ideal case; suppose a drift in which a turn occurs at almost every set; no particular attention is paid to uniformity of grade; sills are placed on the bottom; if there is not quite room enough for the sill to go in, it is placed out of line, or perhaps the miner prefers to operate on the sill with an ax rather than bestow his energies on the interfering ground with a pick or gad, or drilling a 'plug.' Let us see now what happens.

The timbers are placed any way they can be got to stand; if collar-braces or girts are used, one or both must be cut specially for the set, the regular lagging will not suit, they will be too short, requiring longer ones to be cut, or they will be too long, making it necessary to cut them, or else have them overlap those on the preceding set.

Now for the floor. The sill, being set close down to the ground, causes the water, if present, to make a pool until it flows over the sill, or else, if there is room, to pass around the end of it. The argument relating to the lagging overhead, is applicable to those on the floor. On account of the turns of the drift, when the track is laid it will be found to consist of a series of reverse and compound curves, all more or less sharp, making the track extremely difficult to run cars over and costly to keep in shape. If no provision is made for a water-ditch and water is encountered, which is almost sure to be the case, sooner or later, it must flow over the track and running boards, making traffic along the drift disagreeable at all times, if not impossible; the carmen are splashing through water all day long and the car-wheels require constant lubricating; and even then they will fail to run anywhere near as easy as they should.

Another result of continual change of course and a lack of alignment of the sets in the drift is the fact that where it is run through ground that will subsequently be stoped, it will prove extremely annoying and expensive, should it be necessary to erect square sets above the drift, to try and make them conform to the timbers in the drift below; indeed, the best way I know to start the stope-timbering where such conditions exist in the drift as I have hinted at, is to lay another set of sills on the first floor and place them as nearly as possible at right angles to the strike of the lead, thus rectifying on the first floor what should have been done on the sill.

We will now consider another way of doing this work. Suppose a drift is being run on the vein. The procedure will be similar whether hand or power-drills are used. Of course, if the latter method is employed, the face may of necessity be kept well ahead of the timbers, but the ultimate condition of the drift will be the same in both cases. If the floor of the drift is kept down at least six inches below the point at which the bottom of the sill will rest, a good water-ditch will be secured, quite adequate for all ordinary conditions. Two 3 by 6-in. (or wider) stringers may be laid along these sills, spaced say 12 in. apart, the sides of these stringers being each 6 in. from the center of sill and spiked to it. A 2 by 12-in. plank is laid between these stringers, which just fills the space; this is not spiked but merely laid in there and may be removed at any time to inspect or clean up the ditch underneath. The space between the stringers and the sides of the drift may be covered with regular 2-in. plank lagging. The T rails are laid on the 3 by 6 stringers and spiked with reverse-point rail-spikes. This arrangement places the rails one inch above the regular floor, keeps them clear of any rubbish or debris that may happen to be on the floor and makes a good substantial track, as the rail is supported along its entire length.

Whenever it becomes necessary to make a turn in the drift it may be done in several ways, but there are only two that appeal to me as being satisfactory. It may be done by making the entire change with one set, shortening one girt or lengthening the other, or both. If it is merely desired to throw the drift to one side or the other without changing its general course, it may be done by cutting back for a three-post sill and making a side-jump of one whole set; then, when the timbers are to stand on this sill, a double-length cap is placed thereon and the set lagged over in the usual manner, or the three posts may be placed and regular caps placed thereon, and after the face of the drift has been driven ahead sufficiently the center post may be removed, a false cap put under the two regular caps and butt-end posts placed under this at any convenient points, taking care to block up the sill directly below these posts, which will allow the track to be brought around with the largest possible curve. I prefer the double cap in the first place, however, as it finishes the work at once and avoids lowering the back at this point, which is unavoidable if the extra false cap is used, beneath the regular timbers. Whichever method is used, it will be seen readily that no trouble will result when working the first floor, as the regular sets will fit in at that point.

If a cross-cut or prospecting drift is to be run and no timbers are required to support the ground, the rails may be laid on ties; a ditch is made for the water and maintained at the side between the ends of the ties and the side of the cross-cut. Even in this case it would be better to use sills and stringers, unless the cost of lumber is prohibitory, because it makes a cleaner and better track and the ditch, being covered, would not become blocked so readily. Another advantage of the sill and stringer method is that if ore is encountered at some inside point, the grade is established and no change of grade at the bottom of the drift or the rails will be necessary, whereas if the ditch is carried at the side, when we come to the point where we wish to place it under the sills we shall be compelled to raise the track in order to carry it up to the sills and stringers.

I do not wish, Mr. Editor, to encroach on your valuable space with a too lengthy dissertation on a subject which may be considered as of only minor importance. The reason for my writing this at all is the fact that my observations have led me to wonder why so many men who claim to be capable mining men can be content to worry along in such a makeshift manner as they do, apparently under the impression that they are saving money when, as a matter of fact, they are really losing financially, to say nothing of the discomforts to which all concerned are subjected. At a mine I once visited, not a thousand miles from San Francisco, a custom prevailed to take out enough ground to lay the sill flat, then cut out enough of the center of the sill to allow the water to flow. After a while the drift began to take side-pressure and the sills, weakened by this chopping and the pressure against the bottom, buckled up in the center, throwing the track up with it, thereby entailing a large expense for repairs and being a constant source of annoyance.

In the mining business, as in every walk of life, the successful superintendent is he who is willing to pay attention to details; who is ever on the alert to utilize better methods; who is quick to grasp whatever may prove to be of advantage and who refuses to cling to any method of working that is obsolete. A man will naturally cherish his own ideas of working, but when he sees somebody else's scheme that is evidently superior to his own, if he is wise, he will change his tactics and adopt that which will make for better results. It is often the case that first cost is allowed to determine the modus operandi. This consideration should not be permitted to have undue influence. It is well to look ahead and, as nearly as possible, compute the whole cost and whether or not it will be cheaper in the long run to pursue an apparently cheap, parsimonious policy, saying "that's good enough" when the subsequent cost of repairs and maintenance may far outweigh the questionable saving at the outset.

Butte, May 24, 1906. EDWARD W. RALPH.

Extraordinary Prices for Tin.

The 'Iron Age' has the following interesting comment on a striking feature of the metal markets:

When a commodity used so widely throughout the world as pig tin advances by leaps and bounds, as this metal lately has, the fact is worthy of more than passing attention. A month ago sales were made at 38½ cents, a week ago at 40 cents, while in the first week of May the high price of 43½ cents has been realized for 5-ton lots. The metal has advanced over 50 per cent in the last year, as one year ago it was sold at 28½ cents. In spite of these high prices the consumption is keeping up and dealers in the metal report business brisk. This is to be expected, as for some time past consumers believed the market too high and consequently bought only as their immediate needs warranted, with the result that they are now compelled to re-enter the market. This hand to mouth consumption, of course, adds many elements of strength to a market already in an excellent statistical position. In fact, prices in the United States today are nearly one cent above import cost, indicating clearly the premium which spot metal commands.

At present prices importers generally are reluctant to make large commitments, as they fear the market may drop away from them while supplies are on the way from Europe. The advance of the last few days is partially the result of speculation and overbuying of both spot and future supplies by foreign operators. It is a significant fact that the last advance in London of nearly £25 has been brought about on little or no specific information. The London market is in such a state that those who are in a position to buy are afraid to do so, fearing that the market may drop, while those who believe that lower prices will be the rule are reluctant to sell because of the ease with which this last advance of £25 was made. The bull movement which has been running for the past six months is generally attributed to two of the leading operators in London.

There is no gainsaying that statistics are favorable for higher prices than a year ago, and in this connection the accompanying table showing the world's consumption per year and visible supply on the first of April of each year is interesting. It shows that in 1900 the visible supply amounted to 21 per cent of the yearly consumption, while on April 1 of this year the percentage had fallen to an amount that is 12 per cent of last year's consumption, with the consumption of 1906 promising to be greater than that in 1905.

Consumption and Visible Supply Compared—Gross Tons

	1900.	1902.	1903.	1904.	1905.	1906.
Consumption	77,200	87,970	89,000	92,400	90,550	.....
Visible supply	16,191	15,596	15,987	13,695	13,063	11,104

Another factor of interest is that the opening of new mines of the Straits Settlements has been discouraged by the Government and the old workings are not as rich as formerly. The political situation in South Africa, too, has a further bearing on the supply, as there has been a migration of coolies now laboring in the Transvaal, which naturally makes coolie labor higher in the Straits. In spite of the prospect for higher prices as far as the statistics are concerned it is significant that some of those well informed about the situation, who have been consistently holding out for higher prices during the past year, are now decrying the wild scramble for the metal and express the belief that while higher prices may be the rule, still the present sharp advance is hardly justifiable. There is, too, the familiar fact, borne out by history, that when a commodity seems to be rising in price beyond all reason either new supplies are discovered or some substitute is found.

Hydraulic Mining in a Cold Climate.

Written for the MINING AND SCIENTIFIC PRESS by J. P. HUTCHINS.

Hydraulicking, most spectacular of all mining methods, and that which, more than any other, illustrates most aptly the triumph of mind over matter, has a large following among those who are impressed by scenic effect rather than by economic reason. The idea of "harnessing" and "controlling" water, and of using it to tear down gravel-banks has a powerful fascination. Thus, it is not surprising that all through the Alaska and Yukon Territories, attempts have been made to conduct hydraulic mining, where unfavorable physiography and hostile climate are but two of a number of formidable obstacles.

Some further consideration of the fitness of this method of mining in a rigid climate is timely. A renewed interest in hydraulic mines, which the possible resumption of hydraulicking in California occasions, brings this branch of the industry into greater prominence than for many years.

After the discovery of gold in California, in 1848, there was an enormous stampede to the goldfields and over 100,000 diggers were soon at work. The first to be exploited were the shallow deposits in the beds and on the banks of streams and rivers. As these were worked, and the miner followed the pay-streaks, deeper gravel on the flanks of hills was uncovered. Water was ditched to them and 'shoveling-in,' 'ground-sluicing' and 'booming' were practiced, but it was soon noticed, particularly where the gravel was at all hard, that the sluices, whether in rock cuts or wooden troughs, could carry much more material than was being fed to them. More men at high wages were employed to remedy this condition. To get gravel to the sluices by a cheaper method, became the problem.

All the other branches of placer mining, except subaqueous working, were known and had been practised for centuries. Water under pressure had never been used to excavate as well as to transport material. It was the combination of an extremely favorable physiography, permitting water to be conducted by short ditches at an elevation above the gravel, and a large amount of Yankee ingenuity, that resulted in the invention of hydraulic mining in California only four years after the discovery of gold.

It was begun with a rawhide hose and a wooden nozzle, but it developed quickly until finally nozzles of nine-inch diameter were used, pressures over 400 lb. per sq. in. were withstood by steel pipes of large diameter, and volumes equal to 90 sec. ft. were projected in a single stream under the easy control of one man. Thus mining could be done on an immense scale and gravel yielding only three cents per cubic yard could be worked at a profit Under exceptional conditions, even this low figure has been surpassed in cheapness, notably at Flint Creek, Montana, where gravel yielding one and a half cents has been washed at a profit.

Hydraulic mining is really a problem in earthwork. Auriferous material is excavated and moved from one place to another by water power; during its transit, the gold content is extracted. Hence, a deposit containing gold from top to bottom in payable quantity, must be situated where topographic conditions permit the installation of sluices on sufficient grade, low enough to tap the alluvion, but also high enough to permit ample discharge for the tailing. Water must be obtainable in large volume for a considerable period each year, under high pressure, to do the work of excavating and transporting.

The ideal hydraulic gravel is that which is rich, friable, clean, rounded and fine, with its gold content disseminated throughout its vertical section, occurring in large quantity in good environment, on a bedrock possessing sluice-grade near good dump ground and with ample water under heavy pressure. The gold is most easily saved when clean, amalgamable, fairly coarse, and not penetrating deep into the bedrock and its crevices.

Topography is most important in hydraulicking. Its bearing is four-fold: First, it governs the sluice-grade, which affects the carrying capacity of the sluice. Second, it determines the position and length of the sluices. Third, it furnishes good or bad dump. Fourth, it permits or prevents the application of cheap water under sufficient pressure. It was favorable topography, in conjunction with gravel of only moderate richness, that made hydraulic mining so remunerative in California.

The obstacles to successful hydraulicking are various. They include, of course, any characteristics antithetical to those mentioned above. The most common difficulties are those due to bad topographic conditions, which, while not preventing a large supply of water under pressure, are such as to cause deficient grade and dump. There are hundreds of millions of cubic yards of gravel on the western flanks of the Sierra Nevada in California unworkable for this reason. Consideration of the various northern placers will indicate numerous difficulties.

Hydraulicking in Klondike.—The northern alluvion most interesting from a miner's standpoint is that of Klondike. They may be grouped in order of deposition, as was done by R. G. McConnell (Prelim. Rep. on Klondike Gold Fields Geol. Sur. Canada, 1900). His classification was: (1) White Channel or quartz drift. (2) Its associated overlying yellow gravel. (3) River gravel. (4) Terrace gravel work. (5) Valley gravel. While the foregoing differentiation is genetic, another one which can be made, according to the situation of the gravel, relative to the present streams, is more useful to the hydraulic miner. It is as follows: Stream gravel and bench gravel. The first includes all alluvion, in the creek and river-beds; the second all alluvion, whether a few feet or several hundred feet. above the creek-bed. Thus all except valley gravel, under Mr. McConnell's scheme, are grouped under one head. This is entirely arbitrary, but its fitness will appear later in this article.

Stream Gravel.—On account of peculiar physiographic features, which make the Klondike district one of topographic isolation, water is too limited and costly to work the stream gravel by hydraulic methods with elevators or other modified methods. No hydraulicking worthy of note has ever been conducted in the creek-beds; their exploitation must, of necessity, be carried on in other ways. It may be interesting to note, in passing, that an ample supply of cheap water would have entirely modified early-day mining methods and costs in Klondike. It would have made cheaper mining possible, and resulted in a larger product and profit.

Bench Gravel.—These deposits may well be grouped under two heads according to their elevation above the creeks; thus, there are low and high benches. The low benches are peneplains of the creeks; the high benches are remains of the Pliocene creek-gravel.

Low Benches.—These are workable by hydraulic methods where topographic conditions furnish grade for sluice and dump for tailing. They are of small area, shallow section, and infrequent occurrence.

Overburden.—The gravel deposits are usually overlaid by muck, sometimes over 50 ft. deep; this material is solidly frozen, it thaws slowly and is a most serious impediment to mining. Where a large volume of water flows over it constantly, it seems to thaw rapidly; in reality, however, it yields but slowly to the warming influence of sun, air, or water. It is a semi-decomposed vegetable soil having a large content of interstitial ice, and, at times, it contains solid strata and lenses of ice, at varying depth from the surface. An admixture of sand, and, though less frequently, gravel and sand in regular strata, indicates that this material was laid down alluvially, or possibly, diluvially after unusual floods. Like straw and other vegetable matter, it is an extremely poor conductor of heat. It may be ground-sluiced cheaply, when it occurs as an overburden on stream-gravel and the creek can be made easily to cut through it. 'Muck' has low gravity and is thus easily washed away on flat grade when thawed, but where it occurs as an overburden on bench gravel, and is of any depth, it reduces the duty of the miner's inch very materially.

Usually the low benches are properly workable by drifting. A shallow stratum of pay overlaid by a deep, barren overburden, is the reason. There are conditions where hydraulicking may be properly applied, but a modified method, including ground-sluicing the muck with water discharged over the face (thus causing numerous cuts with large thawing area), has proven best.

Character of Gravel.—This, like stream gravel, is composed of small, worn boulders of schist, and of subangular quartz pebbles and sand, all of which were derived by erosion of the country rock and its enclosed veins, and of the higher bench gravel—called the 'White Channel' because of the color of the prevailing content. It usually lies on a blocky, uneven bedrock, into the crevices of which gold sometimes penetrates in such quantity as to make it worth while to mine it to a depth of six feet. The richness is sometimes equal to that of stream-gravel, where for a whole claim, with a depth of about 15 ft. an average yield of about $20 per cu. yd. has been secured. Needless to state, there is little gravel of such value remaining and the hydraulic miner must rely upon material too poor for drifting and not having too heavy an overburden, or gravel that was wastefully exploited in the early days and still possesses workable value and not much overburden.

Cost of Hydraulicking.—This will be high; small deposits of shallow section (making necessary much rock-cutting for sluices and frequent moving of the machines), muck overburden, rough blocky bedrock, and the frozen condition of gravel, are the unfavorable factors.

High Benches.—These are the remains of the Pliocene creeks, and usually appear as a bench deposit with one rim completely removed by erosion. (In one notable instance, near the mouth of Bonanza creek, the deposit is about one mile wide and has both rims intact.) They constitute the famous White Channel, so named by Californians, who were familiar with a similar occurrence in their own State. Together they contain several hundred million cubic yards; the hydraulic process has in several instances been most successfully applied in the exploitation of these gravel deposits.

A definition of that somewhat loose term 'overburden,' is essential. It is often used as meaning barren overlying material; more properly, it should include all material above the pay-gravel, no matter whether gravel, soil, clay, or lava, auriferous or barren. 'Overburden' from the drifting viewpoint may be 'pay-ground' if worked by hydraulicking. It has been said rather generally that the White Channel has no overburden. This is not correct, for, in several operations, where gravel was encountered from grass-roots to bedrock (no soil or muck occurring), the low value of the upper section made it an overburden of serious consideration. All the gravel could have been worked profitably had cheap methods been applicable, but, in the instances cited, there was enough overburden to kill the undertaking.

Klondike is a region of great concentration, both vertical and lateral; the pay-streaks are shallow and narrow. Though a long period has elapsed since the deposition of the White Channel, the actual time during which deposition was being accomplished, is, as compared with that necessary for the formation of the similar deposits in California, much shorter. This is well shown in the sub-angular quartz boulders and gold, the slight dissemination of gold in the top gravel, the occurrence of much rough low-grade gold, and the chaotic mixing of gravel without any general bedding. The characteristics of old rivers are small, rounded, smooth boulders and fine gold (long attrition, through geologic age, is needed to accomplish these results and to cause the occurrence of gold in comminuted particles of great purity), a dissemination of value through the whole gravel section, a deposition of the gravel in strata, and the occurrence of peneplains on the rims. A deposit of gravel in places more than 100 ft. deep, overlies the White Channel. It is of a different color and composition; it possesses low value; in most cases it will be found to be an overburden. There is no muck or soil overburden of greater depth than a few inches on the White Channel.

Character of Gravel.—The boulders are all small; during two seasons I saw none that would weigh over 250 lb. and very few weighing more than 50 lb. There is no clay, little cement, and a fortunate occurrence of fine pebbles and boulders, in helpful proportion, results in a gravel of almost ideal composition for easy excavation and rapid transportation to and through the sluices to the dump. But for its generally frozen condition, it would be ideal, when viewed merely as a problem in earthwork.

Frozen Ground.—This circumstance is a serious obstacle to high duty and adds largely to cost. Large thawing area must be provided; I estimated (after observations at various claims) about 250 sq. ft. of face for each 24-hr. miner's inch, as being needed on a shady exposure. Even where ample surface is available, it is difficult to excavate material from a thin film of thawed face rapidly enough to keep the sluice loaded to its maximum capacity.

Bedrock.—The White Channel is underlaid by a favorable schist bedrock. It is easily cleaned; cuts and tunnels for sluices can be run through it at moderate expense. There are no high rims to penetrate and as the deposits are usually parallel to the present creeks, these tunnels and cuts are short. Although they have been run in frozen rock, no particular difficulty has been encounterd; frozen rock breaks well.

Value of Gravel.—Although much mining has been done on the White Channel there is little information as to the gold product per cubic yard of the gravel mined. What there is, indicates that there has been some rich ground. A yield of over $2.50 per cu. yd. 20 ft. deep. Some worked-out ground (that which had been drifted), yielded over 80c. per cu. yd. in the same way. Virgin ground, 10 to 15 ft. deep, produced over 50c. per cu. yd. when washed. A block of ground previously drifted and said to have yielded $400,000, produced, when hydraulicked, about $4,000. Expressed in another way, 12% of all the gravel contained more than 99% of the

total gold. It has been found in several instances, that ground originally rich, though worked out by drifting, produced more gold than ground unworked, because a little too poor to drift, but thought rich for hydraulicking. This may seem paradoxical, but I explain it by the wasteful early methods leaving much gold behind, and because the upper gravel is poor. In one instance, where hydraulicking was carried on extensively, it was found that calculating the yield per square yard of bedrock uncovered, about the same return was obtained for depths varying from 10 to 60 ft. This circumstance might lead to the conclusion that the top gravel is practically barren. Mr. R. G. McConnell estimates the payable drifting ground of the White Channel at half of one per cent of the total deposit The average depth of the White Channel is probably 75 ft. Assume 20c. per cu. yd. as the present cost of hydraulicking; with an average depth of 75 ft. the gravel must yield about $5 per sq. yd. of bedrock to pay expenses. The gold is clean and amalgamates well even in the cold, dirty water of Bonanza creek

Cost of Hydraulicking.—This is influenced largely by the amount of material moved per miner's inch of water; which in turn depends upon the character of the gravel, the grade and the condition of sluices, and the amount of water used. As noted above, the gravel, when thawed, is washed rapidly. The topography is such as to permit steep sluice-grades and ample dump (many parts of the White Channel being 200 ft. above and on the immediate banks of the creeks). The amount of water has always been insufficient (about 7 sec. ft. being the maximum in any operation); this has lowered the duty and raised the cost. Even then a duty of 8 cu. yd. per miner's inch per 24 hr. has been attained on a sluice-grade of about eight per cent. On the same grade in California, where 12.5 sec. ft. were used against a bank containing many large boulders and some cement, a duty of 24 cu. yd. per miner's inch and 36 cu. yd. per miner's inch where 12% grade was used, is reported by Mr. John Hays Hammond (Ninth Annual Report State Mineralogist California). If large amounts of water, say over 25 sec. ft., are used in Klondike, fewer boulders need be handled and labor bills will be materially reduced. Expense for rock-cuts and sluice-tunnels, as with shallow alluvion elsewhere, will be high.

Dump.—There is ample dump for the White Channel gravel, but much of the ground needed is not yet worked out. Dumping ground has been costly, and worked out claims (about 500 by 400 ft. each) have changed hands for $2,000 to $5,000 per claim, where the seller had (in owning the dump ground) the key to the situation.

Modified Methods.—Inasmuch as the method of handling water in hydraulic mining in California and elsewhere, when ground is unfrozen, has, for its object, the undermining and caving of banks, it is customary, except when washing high banks in more than one bench or stope, to keep the giants on bedrock. Frozen gravel cannot be handled advantageously in this way and it will prove good practice to place the giants, under certain conditions, on top of the gravel, and make the water do ground-sluicing, before reaching the rock-cuts. I tried a method similar to this and got encouraging results; conditions were such, however, that it was not possible to do much of it. It will probably be well to use a bank-head to serrate the face into ravines and thus give large thawing area. I demonstrated this during an experimental run.

Possible Sources of Water Supply.—The Klondike district is a topographic antithesis to the region on the western slope of the Sierra Nevada. Most of the creeks radiate from the Dome as the principal drainage center. The distance to the mouth of the auriferous creeks is about 20 miles; to the point on the creeks where necessary elevation for hydraulicking would place the ditch intakes, is about six miles. Thus it will be seen that extremely limited watersheds exclude the Klondike district proper from consideration as a source of water supply. There are other sources, but they are at a distance, and can only be reached with long ditches, flumes, and inverted siphons. The quantity of water available at not too great distance and at sufficient height to give hydraulic head, after carrying it a long distance through ditches, flumes and inverted siphons, has been investigated both by the Canadian Government and the representatives of mining corporations, and more than 125 sec. ft. is said to be available in each of several streams. The volume of water that will actually be delivered at the mines, in the far north, 30 to 40 miles from points of diversion, is not yet known, no observations of sufficient period and accuracy having as yet been made even with small ditches.

Canals in Klondike.—One of the several unfavorable features of a most hostile environment are those encountered in ditch, flume and pipe installation. Good ditch-ground is rarely encountered on the saddles and slopes of the ridges where ditches must run. The principal deposits, workable by the hydraulic method, are on creeks running in a generally northern direction, and water must be ditched for considerable distance on northern exposures. The surface is covered with a growth of moss, thickest on northern exposures and in the shade of trees and brush. Beneath the moss, a porous vegetable soil (colloquially called 'muck,' and often containing layers of clear ground ice) is encountered. At a comparatively slight depth loose slide-rock or the predominating shattered schist of the region is met. All the material below the moss is frozen solid and makes difficult the maintenance of a tight ditch.

An essential feature of good flume-construction is a bedrock footing for the posts forming the bents or for the sills (where no bents are needed). In many instances (where deep muck is encountered), it is well nigh impossible to get such foundation, for any considerable excavation is likely to start thawing and make slides of such magnitude as to hinder the maintenance of a flume on correct grade (such as is essential in cold climate, where splashing results in ice formation) or at all, for any leakage running under bents on muck foundation will result in washouts. Muck thaws when exposed to running water and is easily washed away by reason of its low specific gravity. Any leakage from waterways (which is, unfortunately, most likely to occur) has a much more serious import in the far north than in temperate zones. I speak feelingly in these matters for the maintenance of a short, small ditch, carrying about 3 sec. ft., on a northern exposure, for a distance of about three miles, was a most difficult and expensive problem. Slides off the upper and lower banks, washouts under flumes, settling so as to interfere with the grade, were some of an unending train of difficulties. Although the ditch was badly built in the first instance, and some of the difficulties would have been eliminated with proper construction, there were many troubles which even well-constructed waterways will encounter in the far North.

Ditch Construction.—Many costs may be quoted and C. W. Purington ('Methods and Costs of Placer Mining in Alaska,' Bulletin 263, U. S. Geol. Sur.) covers this subject thoroughly, but it is only necessary to note that common labor costs $6 per day; skilled labor, $8 to $10 per day; lumber, $50 to $60 per M for inferior stuff of 10-in. width and $10 per M more for 12-in. width; a man and two-horse team, $20 per day; hay, $80 per ton when cheapest (all these prices at Dawson). These figures make it apparent that water-way construction, even where easy slopes and free material allow excavation by plough and scraper, is extremely costly. Maintenance is likewise very high, for an exceptional environment causes a greater expenditure for this item than almost anywhere else in the world. Each spring brings a heavy expenditure for re-grading and repairing flumes damaged by snow and ice, for repairing ditch-banks where freezing and thawing have caused slides, and for mending pipe-lines which have been subjected to a temperature of —65° F. and have consequently contracted greatly. Steel contracts about 1 in 1600 for 100° F. change of temperature. Such a range is common in Klondike where pipes have a temperature of about 40° F. when full in summer, and about 100° F. if allowed to be empty, where exposed to the sun; in winter they must be emptied to prevent freezing solid and consequent bursting, when the temperature falls to —65° F. Burying pipes, to a great degree, prevents difficulty from contraction and expansion.

Water may be had under sufficient pressure, though it will require long ditches, flumes, tunnels and long, deep siphons to conduct it over such a rough country. The season is about 135 days, counting on the thaw having progressed to such a degree as to furnish water about May 15, and continuing until about October 1. This does not mean that the mining can be carried on to advantage during all of this period. The early spring nights are so cold and superficial thawing has progressed to such a slight degree that hydraulicking cannot be done satisfactorily, and only a low duty is attained. Hydraulicking must cease about October 1. With long ditches heading at high elevations and traversing northern slopes, it is probable that the actual working season will be less than the time now counted, namely, about 120 days. Even if water be available, it is unwise to prolong operations too late; spray from the nozzles forms a coating of ice which delays the next season's operations, and the possibility of being caught by a cold snap with damage to undrained pipes, gates, flumes, ditches, etc., is a serious menace.

Opening ditches and flumes, by clearing them of accumulated ice and snow, is particularly slow and costly on northern exposures. This has not been an important consideration as yet, all ditches being comparatively short, but operations that involve the maintenance of long ditches and flumes on northern exposures must prevent ice and snow accumulation as much as possible (either by coverings or otherwise) or allow time and expense for a yearly clearing. In either case, whether by installing so as to prevent it, or by cleaning ditches each year, a large item is added to the cost of construction and maintenance. Ample water can be obtained, but only at a great expense.

As water has not yet been brought through long canals in large volume, the cost of it cannot be given. Estimates made by engineers and miners, who testified before a government commission investigating concessions at Dawson in 1903, varied from 25c. to 75c. per miner's inch per 24 hrs., as the cost of water supplied if ditches were installed. These are mere estimates; but it is certain that water will cost several times as much as with ditches similar in length and capacity to those in California.

In the illustrations given herewith, Fig. 1 shows hydraulicking on the White Channel with about 7 sec. ft. of water. The ground has been drifted, and numerous timbers are seen in the pit. The character of the boulders is well shown. The main supply pipe, 15 in. diam., appears in the left foreground, and the bedrock cut shows well. Men are engaged in cleaning up the bedrock.

Fig 2 shows hydraulicking with pumped water in the White Channel of Last Chance creek, an affluent of Hunker creek. This work costs about 40c. per cu. yd., and the ground is found to yield about 50c. per cubic yard.

Copper Production. The world's copper production as figured by Henry R. Merton & Co., in tons of 2,240 pounds, is:

	1905.	1904.	1903.
Australia	36,560	34,160	29,000
Canada	20,535	19,185	19,320
Chili	29,165	30,110	30,930
Germany	22,160	21,045	21,205
Japan	35,910	34,805	31,360
Mexico	65,185	50,945	45,315
Russia	8,700	10,700	10,320
Spain and Portugal	44,810	47,035	49,740
All other countries	32,715	30,925	29,980
	295,740	278,955	267,170
United States	*413,070	**362,740	311,627
Total	708,810	641,695	578,798

*Henry R. Merton & Co.'s estimate.
**As per U. S. Geological Survey.

Vanadium is a rare metal which has come into prominence within the last four or five years, on account of the great increase in tensile strength, elasticity, and is vanadinite, or chloro-vanadate of lead. In the pure ductility it imparts to steel when added only to the extent of about 0.2% to 0.5%. Its most important ore state it should contain 19.35% V_2O_5, but the ores actually used for the manufacture of ferro-vanadium generally only contain about 10% vanadium oxide.

Tungsten has become of renewed interest within the last five years, owing to its wide and successful application for the manufacture of self-hardening rapid-tool steels. Its chief ores are wolframite, $FeWO_4$, in which some of the iron is often partly replaced by manganese; hubernite, $MnWO_4$, and scheelite, $CaWO_4$. The ore most suitable for the production of the metal is wolframite. Although found in many places, it does not occur in large masses. In the pure state it should contain over 70% WO_3, but such ores are not plentiful, and the average grade runs between 60 to 70% tungstic acid.

Molybdenum in many respects resembles tungsten, belonging to the same group of elements, and is used for similar purposes, though not nearly so expensive, one of the reasons being that it is more difficult to prepare in the pure state, and that its ores are not plentiful. The effect it has upon steel is not finally settled, and though it is said to be from two to three times as powerful in its action as tungsten, it is not to be relied upon to the same extent, as it is more difficult to alloy with steel, because of its liability to oxidize and volatilize. The chief ores of molybdenum are molybdenite, MoS_2, and wulfenite, $PbMoO_4$, both comparatively rare minerals. In the pure state it contains 60% of the metal and 40% sulphur. According to some manufacturers, wulfenite is the best raw material for the preparation of suitable metal. It is first melted with soda ash and carbon, resulting in the formation of metallic lead and a fused mass of molybdate of soda, from which molybdic acid is separated. The latter is then reduced with carbon in crucibles much like tungsten, yielding a gray metallic powder of about 95% purity with 2% to 3% carbon, and a considerable quantity of undecomposed oxides.

FIG. 1—HYDRAULICKING ON THE WHITE CHANNEL.
With 3^1_2 sec. ft. in drifted ground.

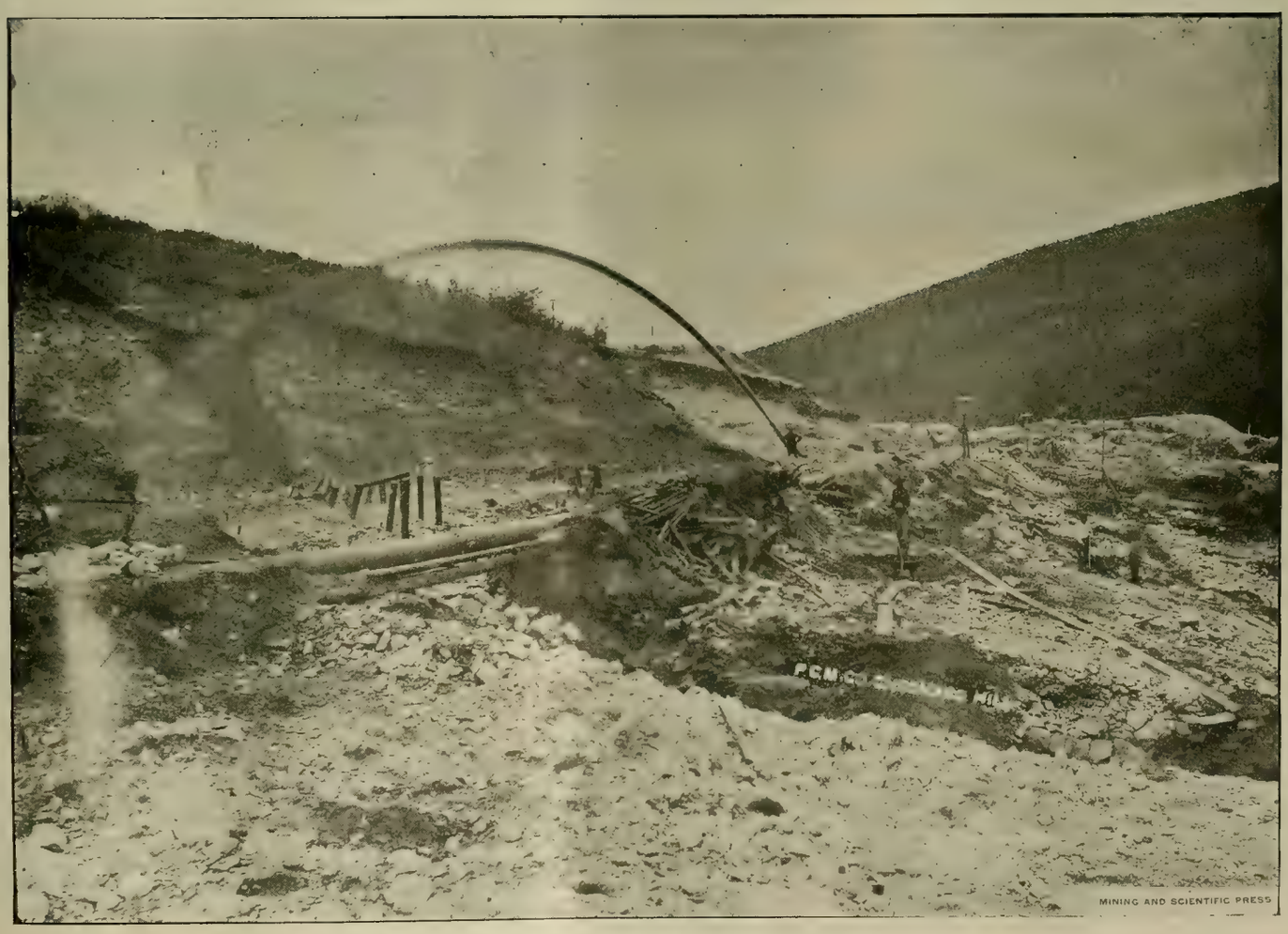


FIG. 2—HYDRAULICKING ON THE WHITE CHANNEL.
With about 7 sec. ft. in drifted ground.

Metallurgical Development on the Rand.

Contributed to the MINING AND SCIENTIFIC PRESS, and read before the South African Association of Engineers, April 11, 1906, by G. A. DENNY and H. S. DENNY.

As far back as July, 1903, one of the writers had the temerity to traverse current practice and make many alterative suggestions representing departures of a radical nature. These recommendations were substantially: (1) To substitute coarse for fine screen on batteries. (2) To discard all mechanical concentration. (3) To separate the coarse product by hydraulic devices. (4) To re-grind coarse products in tube-mills. (5) To provide secondary amalgamation tables after the tubes (6) To improve the methods of inter-handling in slime-plants. (7) To make use of the filter-press in the treatment of slime. (8) To investigate the economical possibilities of reducing the whole of the mill-pulp to a fitness suitable for filter-pressing, and thus treat one product in one operation.

The point upon which the greatest emphasis was laid was the necessity for fine grinding, and overwhelming evidence was produced to prove conclusively that the pyritic constituent of the Witwatersrand ore, after being subjected to fine grinding, yielded its gold to an ordinary cyanide solution as readily as the silicious portion of the ore. It was further stated that by the use of the tube-mill the duty of the stamps would be increased and the extraction improved.

As the result of these suggestions, the first tube-mill on the Witwatersrand was introduced at the New Goch mine, and this one was followed a little later by several others at other mines. Since that time there has been a good deal of experience gained in the use of the tube-mill, but it is a significant fact that the recommendations above specified in regard to the tube-mill, secondary amalgamation, coarse screening to get increased stamp duty and higher extraction, have been followed and generally accepted in this mining center. The further suggestion to filter-press has not been followed outside of the group of mines technically controlled by the writers, and many other departures have since been jointly advised and put into practice at the Meyer & Charlton and the New Goch mines. It is on the results of the work done at these two mines that the writers propose to base the whole of the statements to be embodied in the present contribution. The real metallurgical work began in January, 1906, and we have therefore had three months in which to go into detailed investigation.

The consumption of water at the Meyer & Charlton is now 170 gal. as against an average of 500 gal. at other mines. The actual saving is illustrated by the fact that whereas before the new plant was installed the amount of water available was only just sufficient to meet the daily requirements, there is an excess today of over 100,000 gal., equal to some 300 gal. per ton of ore crushed. The consumption in the metallurgical plant is 36.8 gal. per ton of ore crushed.

At the Meyer & Charlton plant the average cost of cyanide in March was 4.19d. per ton treated, the actual consumption of cyanide being half a pound, equal to a total of 5,376 lb. The cost of lime was 0.157d. per ton treated, the actual consumption being 0.8 lb. per ton treated, the total consumption being 8,460 lb. The total amount of solution in circulation amounted to 2,133.3 tons, which had an average strength of 0.038% KCy, and an average value of 2 dwt. gold per ton, the total cyanide contained being 1,638.05 lb., and the total gold content 213 oz., the alkalinity averaging 0.008 per cent.

The average amount of gold dissolved in the mortar boxes is 1.37 dwt. per ton of ore crushed. The effect on the plates is marked, and at the Meyer & Charlton it was such that the lower portion of the plates has been cut off, as it was found that they were doing no good as far as arresting gold was concerned, while on the other hand they were showing signs of pitting and gradual disappearance in the circulating solution. These plates, however, are 12 years old, and were thin when the circulation of solution was begun. It is believed that an electrolytic action is set up as between the mortar-boxes and the plates, the cyanide solution being the medium; hence the solution of the copper. A number of investigations on the point have been carefully carried out. It is estimated that the life of copper plates with circulating cyanide solution will be something like three years, and it may be possible by the short-circuiting of the currents set up between the boxes and the plates to reduce the solvent action. Assuming, however, that the life of the plates is only two years, and that the plates themselves are only half the size of those generally adopted, the cost per ton becomes insignificant.

The recovery by amalgamation now as compared with the old system, illustrates clearly the effect of taking the fine gold into solution, the respective figures being: Recovery by amalgamation in January, 1905, 50.124%; recovery by amalgamation in January, 1906, 45.202 per cent.

There is one aspect of amalgamation worthy of mention, and that is the danger of theft, for it is a fact that there is a big illicit trade in amalgam, and the writers are of opinion that amalgamation could be dispensed with altogether under this scheme. The point has not yet been proved, but it can easily be put to the proof, and this will be done in the near future. It would be safer to have all the gold in one place, namely, the extractor boxes.

Originally it was hoped that filter-pressing would be unnecessary. This hope was based on the assumption that a product could be discharged continuously from the last vat, which would contain not more than 50% moisture. After some years of experience the conclusion was reached that this was impossible, and at the Van Ryn mine, two years ago, an arrangement was built for returning solution from the slime-dam. After careful consideration, however, and after giving due weight to the maintenance of slime-dams, cost of pumping back solution, losses by absorption, and the danger of the dams giving way, there could be no further doubt that filter-pressing must be adopted to complete the operation. The slime-plants at the New Goch and Meyer & Charlton are now simply being used as storage-tanks; that is to say, the whole of the available gold is in solution before the slime reaches the slime-plant, and therefore it is not called upon to do anything in that direction. At the Van Ryn, where solution is not circulated, the slime-plant is showing over 93% of the total gold in solution in the first four tanks. At the Charlton, however, with the circulating solution, this gold has already been absorbed before the slime-plant is reached. The superiority of the design of this plant over the ordinary type of decantation plant, is that the inter-handling can be done simply by the regulation of a valve and at no cost; and as a storage plant, to be worked jointly with a filter-press, it has many points of advantage.

In view of the fact that the circulating solution has already been in contact with the sand before it reaches the sand-plant, the value of charges under present conditions shows a big reduction, and from an 8-dwt. screen-assay the present condition gives a return in the settlers of under 1.5 dwt., and in the treatment-tanks of 1.4 dwt., which, under old conditions, would, in the latter, have been in the neighborhood of 5 dwt. The sand-plant consists of eight vats in all, four of which are superimposed and are called the 'settlers,' the four below being called the 'treatment-tanks.' As a matter of fact, however, solution is being pumped to the settlers as well as to the treatment vats almost constantly, and by this means, instead of a treatment of four days, which would have obtained under the old system, a treatment of nine days is obtained. The sand-plant is only responsible for 10% of the total gold recovery, which when set against the cost of operating the plant and the interest on capital outlay, at once proves it to be a most expensive department. If the interest on capital outlay and the actual operating costs of this plant be allowed as a credit toward the cost of all sliming, it leaves a big margin in favor of fine grinding, and the intention of the writers on this evidence is entirely to discard the department so generally devoted today for the treatment of sand. Not only this, but the residue from the sand-plant has neither the consistency nor the low value of the filter-press product, and sufficient investigation has been done to indicate that if coarse sand be reduced to 150-mesh it can be filter-pressed just as well as ordinary slime. The average residue then, instead of being in the neighborhood of 12 gr., would be reduced to, at most, six grains per ton.

On a basis of 96 tons per day passing through the tube-mill the extra revenue is £15 15s. 7d. per day for each mill in use. The deduction generally is that fine-grinding is a necessary corollary to any metallurgical treatment of Rand ore, and the evidence points to the further extension of this principle.

Experimental data show that filter-pressing is one of the most necessary operations that has yet been introduced into local practice. The points are the great saving of water, the increased extraction, the saving of cyanide, the economy of time in treatment of slime, and the production of a better product for handling on the slime-dump. The operation is one of the very simplest, and experienced white men who have been filter-pressing for many years in Western Australia are quite satisfied that the native is just as good a filter-pressing hand as the white man. The reason why this method was not adopted earlier was due to the fear of excessive cost. Our figures not only disprove this idea, but show that filter-pressing is the most important operation in the whole range of treatment. The average residue from slime during March at the Charlton contains 0.2886 dwt. The fineness of the gold was 753.962, and the amount of acid used 4,988 lb., equal to 1.304d. per ton treated; and the amount of zinc used 3,834 lb., valued at £63 18s.

The addition of a filter-press plant to the mill settles one point that is usually subject to inaccuracy, and that is the tonnage of slime handled. The relation of extraction to tons multiplied by screen-assays has not, in the past, been so close that this point has come up for serious discussion, but in the future there is no doubt that more attention will have to be given to it.

The costs for the month of March are as follows:

	Total cost Pounds.	Cost per ton milled. Pence.	Cost per ton treated. Pence.
Tailing-elevator	279	6.23	6.23
Sand-treatment	447	9.99	14.08
Slime-treatment	362	8.08	27.82
Extractor-house	436	9.73	9.73
Total cost.....	1,523	34.03	57.86

It will be noticed from this statement that the cost of elevating the pulp is high, figuring at 6.232d. per ton milled. Apart from this cost, the actual expenditure is 27.811d. per ton milled. When it is considered that this covers the whole cost of sand-treatment and slime-treatment, including filter-pressing and the cost of dumping residue, this result must be regarded as eminently satisfactory for a new plant.

As already indicated, the sand-plant is only responsible for 10% of the gold recovered; while the slime-plant is doing nothing, and therefore is not required. The highest residue is in the sand-plant, and the costs of running it are also high. The final conclusions on actual data are (1) that the credit of the cost of re-grinding to be established by discarding the sand-plant, and, allowing for the interest on the capital outlay and the actual working costs of the sand-plant, is more than is required to cover the whole of the cost of re-grinding; (2) that the extraction on the one-product basis, where everything would be filter-pressed, shows a further improvement in favor of all-sliming; (3) that a plant on the all-sliming basis could be erected complete at somewhat less than 50% the cost of the ordinary sand and decantation slime-plants of today, to give a much higher and far more consistent recovery, and to be worked at a much lower cost. In the design of the all-sliming plant the stamp battery is left out, the principle being crushing and grinding in stages.

The grinding analyses of the products show some curious features. One in particular is that the grading of a settled sand is quite different from the grading of the charge which that sand represents when transferred from the top to the bottom tank. It is difficult to determine exactly how this change is brought about; but, as the results have been confirmed in many investigations, there can be no question that the change does take place. It may be said that work could not be carried out satisfactorily without grading analyses.

Shortly after starting the plants, the residue value, both in the slime and the sand plants, occasionally was high. In every case, it was found that high residues were due to reasonable causes, such as could easily be controlled when the operators had a full knowledge of the conditions. There is no reason why the filter-press residue should ever be higher than 6 gr. or the sand-residue be higher—given that the tube-mills are running—than 12 gr., and this quite apart from the screen-assay. Taking the case of the Meyer & Charlton, however, which in March had an average screen-assay of 10.871 dwt., the average residue in the sand was 144 gr., and in the slime 6.91 gr. The percentage of the total pulp represented by sand was 70.763, and the slime 29.050. This gives an average residue of 12.39 gr., equal to an extraction on the screen assay of 95.302%. The total gold cleaned up shows an actual extraction of 95.5%. In this plant 96% theoretical extraction should be easily and consistently realized, and allowing for 1% loss in the smelt and clean-up, etc., the actual gold in the bank should be 95 per cent.

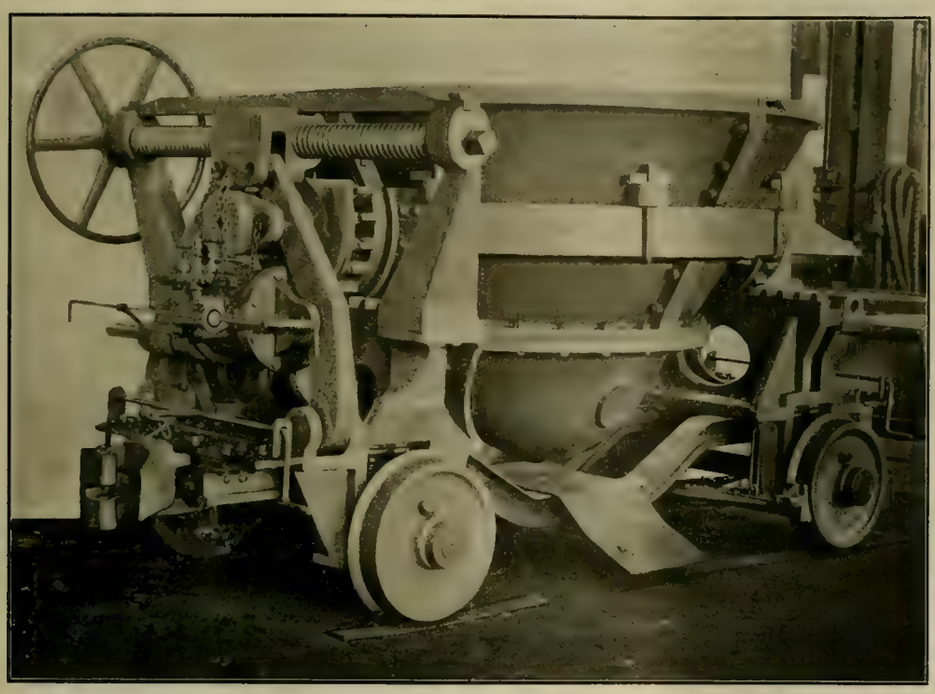
Mannesmann tubes are weldless pipes made by a peculiar process from the solid steel bar. Three and four-inch tubes, 0.25 in. thick, have been tested to 2,000 lb., while corresponding cast iron tubes will stand but 200 lb. and wrought iron but 1,000 lb. per sq. in. This great tensile strength is probably due to the fact, that, in addition to being much more worked than most metal, the fibers of the metal run spirally, as has been proved by microscopic examination. Lengths of such pipe up to 70 ft. long and 3 in. diam. have been made by this process.

The Hand-Stamp.

Written for the MINING AND SCIENTIFIC PRESS by GEORGE J. BANCROFT.

One of the difficult things about sampling a mine, particularly a large one, is the crushing of the samples. I like to take plenty of large samples, but, before I hit upon my present method of crushing, I was sometimes sorely tempted to 'skimp the job' and take small ones. So I think a device that makes less onerous the bothersome work of crushing samples will be welcomed by many engineers.

My device is particularly applicable for wet or 'gummy' samples and for those mines where no power-crusher is available. It may be described briefly as a hand stamp. Stamp and crushing plate may be made in an unlimited number of ways. An investigation of the mine 'scrap heap' will generally reveal something that will do to shoe a stamp or make a crushing plate. The accompanying illustration shows a hand-stamp made of a sawed-off mercury flask and a scantling. A good stamp can be made of a piece of four-by-four shod with strap-iron. The thicker the iron the better, but if no thick stuff is at hand, the iron may be doubled. An all-iron stamp is also a good tool and the mine blacksmith can generally manufacture one out of material on hand. The essential things about the stamp are that it should be about four feet long, have a face about four inches square and weigh from 15 to 18 lb. The crushing plate can be made from any flat piece of iron that is three feet square or larger. The bottom of an old amalgamation pan makes a fine crushing plate, but it is apt to salt the samples. Generally the best thing available is a turn-sheet. This makes a good crushing plate if it has a firm, flat foundation. A platform of new rails or of heavy timbers is useful for this purpose. At a pinch a large flat rock may be used as a crushing plate but, of course, it has the objection of being hard to clean.



A HAND-STAMP.

Recently a young engineer, by name S. A. Ionides, who was traveling with me, prepared some figures on the relative speed of crushing with a hand-stamp and with the old method of single-jack and die. The average of several tests showed that a Mexican would crush one-third of a pound by the aid of a single-jack in one minute, while, in the same time with a hand-stamp he could crush two and one-half pounds, the samples in each case being crushed to about the size of corn. The hand-stamp then is about eight times faster than the single-jack. A mortar and pestle I have found to be even slower than the single-jack and die, but I have no comparative figures.

In crushing with the hand-stamp the sample is dumped on the crushing plate and spread out with the foot. The crushing then begins, the operator moving about the plate till all is crushed. It comes natural to strike just between the feet, so the feet keep the brittle stuff from flying, to some extent, but if trouble arises from flying bits some boards may be set up around the plate. After crushing, the plate is often useful for a preliminary quartering, particularly if the sample is very large. If the plate is on a platform and so arranged that a box or other receptacle can be put under one edge, the operation of removing the crushed sample is greatly facilitated.

A New Slag Car.

The accompanying illustration shows a 10-ton slag-car, of which 15 were recently built by the Power and Mining Machinery Company, of Cudahy, Wisconsin, for the new Garfield plant of the American Smelting and Refining Company near Salt Lake City. Some idea of its size can be gained from the over-all dimensions,—15 ft. long and 6½ ft. high. Each car weighs 27,000 lb. when empty, or 47,000 lb. when filled with slag. The bowl is made in five sections, the bottom being made in one piece with four quarters forming the top. This allows of any worn or broken part being easily replaced. These sections are securely bolted together and tied to a steel supporting ring by key-bolts. The supporting ring is securely riveted to the pinion-toothed trunnions which roll on a racked track. The pinion and the rack are both made open between the teeth to prevent their being clogged by any slag which might be spilled into them. The trunnions are rolled by means of a sleeve which is operated through a lever by a 12-in. compressed-air cylinder. This cylinder is designed to operate on 60-lb. pressure and to tilt and hold the pot in any desired position. The air-valve for this cylinder is a simple four-way cock conveniently operated from the side of the car. All the levers and other operating parts are made of steel to reduce the weight of the machine without sacrificing strength. A hand-wheel and screw are also provided so that the bowl can be dumped by hand, should the air-supply fail from any cause. When tilted to the extreme position, the side of the bowl makes an angle of 50° so as readily to allow the slag-skull to slide out. The bowl in dumping is carried to the side of the car by the rolling of the trunnions, so as to dump outside of the rail. An apron in the middle of the truck prevents any drippings from falling on the track. The entire body of the car is carried on eight powerful springs placed under the front and rear supporting frames and resting on the main bearing-boxes. These bearing-boxes are fitted with phosphor-bronze bearings which are kept lubricated by removable oil-waste boxes. The two supporting frames are tied together by two 100-lb. rails securely riveted to them, and extended to carry the Tower automatic couplers. These are provided with the usual side-crank attachment for releasing the coupler. One of each pair of wheels is provided with a bronze bushing so that it can revolve on the axle when going around a curve. A large factor of safety was used in the design of all the parts of this machine because of the rough usage to which it is put. Special pains were also taken to make it as simple as possible to operate for the men usually employed for such labor. Slag-cars of this design are made in various sizes up to 15 tons in capacity, and with or without the air-cylinder.

A NEW SLAG CAR.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock specimen from Independence, Cal., marked F. C. is mostly Garnet, accompanied by Calcite. It is somewhat unusual in containing pyrite.

The samples from Chilpancingo, Guerrero, Mexico, marked E. I. R. are as follows: No. 1, altered greenstone with calcite, and a little quartz. The bright mineral is mostly pyrite and galena; No. 2, silicious amphibolite schist; No. 3, a dense, silicified greenstone schist with pyrite; No. 4, talc schist and quartz; No. 5, quartz; No. 6, principally quartz with sulphide of zinc, iron and lead. The zinc in this sample is most abundant, the mineral being brownish crystallized and brilliant zinc-blende; No. 7 is a complex sulphide ore, consisting of intimately associated iron, lead, copper and zinc sulphides in an altered and silicified greenstone. No. 1, 6 and 7 probably also contain gold and silver.

Collapse of the Open Workings at the Kimberley Mine.

On Thursday morning the loose shale on the sides of the Kimberley open mine commenced to fall in, and throughout the day the wonderful spectacle was presented of huge quantities of loose material sliding down from many parts of the exposed workings just below the rock level and disappearing into "the biggest hole in the world." General attention was drawn to the fact that a slip had occurred about 10 o'clock, when a vast mass of shale fell from the east side of the mine, near the surface, and crashing down to meet its first obstruction nearly a thousand feet below, raised a dense cloud of dust, which hung over the mine for some considerable time. As the day advanced the extent of the slip was gradually extended, until, late in the afternoon, thousands of tons of shale were pouring down the big hole from practically its whole circumference. At noon the falling material was distinctly visible as it started on its downward career, but later in the day, so general was the area affected, that the resultant thick pall of dust obscured everything from view. Hundreds of people visited the vicinity during the day, the spectacle afforded, with the accompanying noise, being a somewhat weirdly affecting one. The moving ground disappeared from view with a sound like that of a mighty waterfall, and the well-known abandoned workings took on a new appearance before one's eye in a startling fashion.

A HAND-STAMP.

The slip is attributed to a subsidence as the result of the recent rains. Some one thousand feet from the surface the falling shale fell harmlessly upon the accumulations of previous slips and the closely packed material which forms a roof nearly a thousand feet thick above the workings of the mine below. The workers down there never heard the crash with which the additions to the mass above them descended, and were unaware that material was falling in such quantity in the open mine until they regained the surface at the change of shift.—London 'Mining Journal' from 'Diamond Fields Advertiser.'

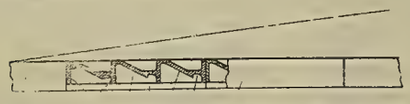
Mining and Metallurgical Patents.

Patents Issued April 24 and May 1, 1906.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

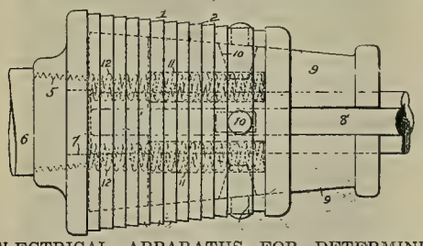
GOLD-SAVING APPARATUS, No. 818,834. I. P. Lambing, Denver, Colo.

In gold-saving apparatus, a sluice, a structure contained therein consisting of a succession of walls arranged substantially at right angles with the plane of the sluice, intermediate inclines having a steeper inclination than that of the sluice, transverse mercury-containing channels at the top of each incline and below the top of the walls, and other channels at the junction of the inclines with the bases of the walls.



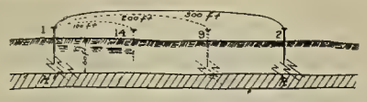
CHUCK FOR ROCK-DRILLS. No. 817,609. T. E. Adams, Cleveland, Ohio.

A drill-chuck comprising a body having a tapering interior, a series of tapering jaws in said drill-body, each jaw having a socket in its rear end, a separate spring for each jaw, said springs entering the sockets in the jaws, and a series of pins rigidly secured to the chuck-body, said pins projecting inwardly from the inner wall of the chuck-body and entering between adjacent jaws.



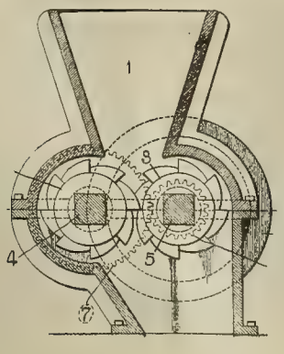
ELECTRICAL APPARATUS FOR DETERMINING THE LOCATION OF METALLIC ORES, No. 817,749. F. H. Brown, Los Angeles, Cal.

In an apparatus for locating metallic ores and similar substances in the earth, means for establishing two electrical circuits, one of which includes a variable resistance and the other is adapted to contain the portions of the earth to be tested, means for causing a divided current of electricity to pass over circuits in unequal volumes, means for indicating the difference in volumes, a contact for movably engaging with resistance to equalize volumes, and a telephone-receiver for determining when volumes are equal, receiver being in the circuit having the variable resistance and connected with and forming a part of the means for indicating the difference in volumes.



PRELIMINARY BREAKER FOR CRUSHERS AND PULVERIZERS, No. 818,328. M. F. Williams, St. Louis, Mo.

In an apparatus of the character described, the combination with a casing, the upper portion of which forms a hopper, two shafts having squared portions mounted in said casing below the hopper, cylinder-sections arranged on the squared portions of said shafts in intimate engagement with each other and provided with V-shaped teeth, the cylinder-sections of one shaft being staggered with relation to each other, whereby the paths of travel of teeth intersect each other on the respective cylinders, a pulley on one of shafts, a pinion on the other of shafts meshing with gear whereby shafts rotate at unequal speeds, and a balance-wheel on the shaft carrying the pinion.

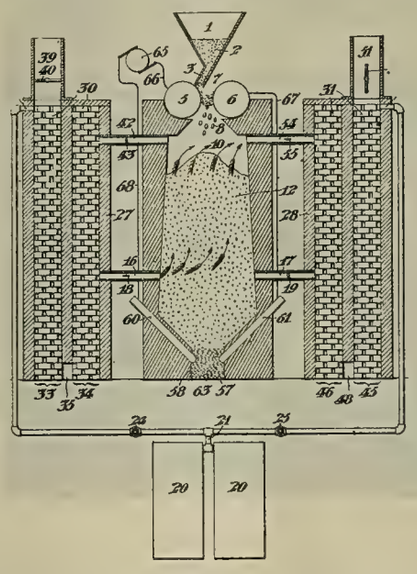


MINER'S PICK. No. 817,512. W. S. Palmer, Blairsville, Pa.

A miner's pick comprising a head provided with a longitudinal bore in the opposite ends thereof, said bore having grooves at opposite sides thereof and provided with a transverse opening 5 intersecting the terminal end of said bore, a detachable point having a reduced stem to enter said bore, and radial flanges to engage grooves, a reduced threaded shank to project into said transverse opening, and a thumb-nut mounted upon the threaded shank of the stem.

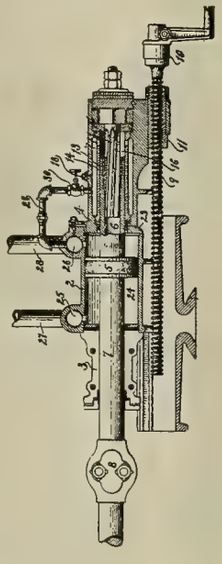
PROCESS OF MANUFACTURING IRON AND ITS ALLOYS, No. 818,918. M. Ruthenburg, Lockport, N. Y.

The continuous process of reducing ore to the metallic state, which consists in fritting comminuted particles of ore in coherent porous lumps, collecting the lumps in a confined heated atmosphere, then before lumps have fallen below a reducing temperature, subjecting them to the action of reducing media in confined heated atmosphere and reducing them without fusing them, and then increasing the temperature of lumps, until the reduced metal is melted.



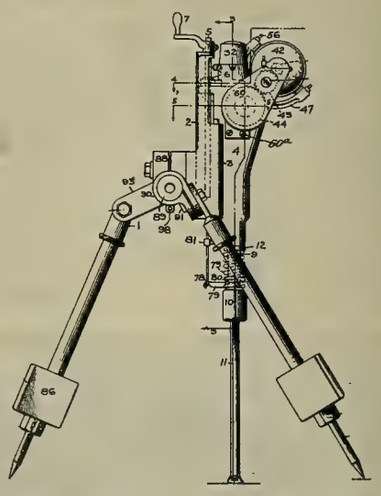
ROCK-DRILL, No. 818,681. H. Gibson, Easton, Pa.

A rock-drill piston having a tail-rod, a cylinder having an extension provided with a tail-rod chamber and having a vent-opening leading from chamber to the external atmosphere, and motive-fluid-pressure pipes for the cylinder, cylinder having a passage leading from one of pipes to the tail-rod chamber.



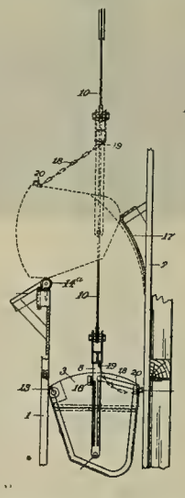
ROCK-DRILL, No. 818,015. R. Binnie, Sr., Bolivar, Pa.

In a drill, the combination of a support, a drill body or casing movably mounted thereon, a reciprocating drill-spindle mounted in casing, an actuating-shaft for spindle also mounted in the casing, a motor mounted directly on the casing on trunnions at right angles to the actuating-shaft, cushioning means between trunnions and the casing, and gearing connecting motor and drill-actuating shaft.



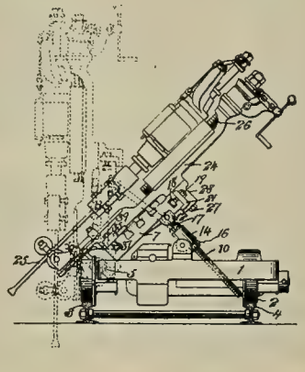
DUMPING-BUCKET, No. 818,668. J. Close, Columbus, Ohio.

A bucket-dumping device comprising a bucket, a bail pivotally secured to its sides near the bottom thereof, a shaft, vertical guideways for bucket disposed therein, means for hoisting bucket in shaft, the latter having a dumping-opening in the face thereof, means not connected with guideways on the back side of shaft opposite dumping-opening and projecting into shaft into the path of bucket to overthrow the same outwardly, and flexible means to limit its dumping movement.



CHANNELING-MACHINE, No. 818,558. W. Prellwitz, Easton, Pa.

A channeling-machine comprising a suitable support, a back plate mounted on the support, means for tilting the back plate, a carriage mounted on the upper edge of the back plate, a drill-carrying shell pivoted to the carriage and means for clamping the shell to the face of the back plate.



Special Correspondence.

JOHANNESBURG, April 3.

The whole community has been shocked beyond words by the news of the awful catastrophe that has befallen San Francisco. The deepest sympathy is felt here for the fair City of the Pacific, in this her hour of woe. Everyone hopes and believes that while the visitation may bring financial ruin to thousands, it will not break the spirit of the citizens of the great City; that they will set to work to build up the desolate places, with that determined American courage which is so well known, and so well appreciated the world over; that in the future the people of San Francisco will point to the re-built city with the same pride that the citizens of Chicago and Galveston exhibit, when they show the stranger how they faced their ruin.

Affairs in Johannesburg are moving along fairly well. The March output of 443,723 oz. establishes a record for the Transvaal and is distinctly encouraging. The war cloud in Natal is being watched with interest. The feeling is that there will be no Zulu rising, but precautionary measures are being taken. Recruiting has commenced, and last week 25 of the Rand unemployed left to join the forces in Natal. They are to receive 5s. per day. A native rising at the present time would be a terrible thing for South Africa. It would cost millions to put it down. Should it come, all the white inhabitants would stand by Natal. There is no danger of any native tribes joining the Zulus.

A commission has been appointed by the government to inquire into Chinese crime along the Rand. It is to be hoped that the labors of the commission will bring about means to stop the crime of the Chinamen, but it is a difficult problem. If every householder, especially in lonely districts, were fully armed, the Chinese would soon decide that robbing farms did not pay.

Good Friday is a legal holiday, and it is also Labor Day on the Rand. This year there was the usual demonstration of labor in Market Square, Johannesburg. The labor leaders made characteristic speeches, in which capitalists were more or less blamed for all woes that afflict the Transvaal. An eight-hour day on the mines was demanded; protection for struggling industries was recommended; unaltered opposition to Chinese labor was announced; political questions were discussed, and the working men advised to send their own men to Pretoria. The repatriation of the coolies was, of course, recommended, and the speakers held that more pressure should be brought to bear on the Kaffirs to make them work. Labor organizations on the Rand are, on the whole, rather weak. Most sensible men realize that the skilled workman on the Rand is better off than in most places in the world. If the Chinese were repatriated, they know that the majority of the mines would close down, and that hundreds of white men would be brought to the verge of starvation.

TORONTO, May 24.

Cobalt has had its first serious disaster in the form of a dynamite explosion followed by a fire on the 18th inst. In view of the crowding together of flimsy wooden structures and the lack of an adequate water-supply and fire-protection service, the destruction of the town has long been anticipated as likely to occur at any time. However, the threatened calamity was not of as serious a character as the first reports indictated, and later details, though meager, show that the fire was got under control before it became general, and that no loss of life or serious bodily injuries resulted.

Several important finds have been made recently. For some time diamond-drilling has been going on at Clear lake, a short distance west of town. Major Gordon, mining engineer, having traced a vein on the lake shore, undertook the work of prospecting the area under water and put down a drill-hole by means of a casing pipe in 60 ft. of water. Bedrock was struck under eight feet of mud and boulders, and a core from the vein was found to assay well in silver, besides containing a nugget of native silver weighing about an ounce. The rock at the bottom of the lake has been ascertained to be Huronian, which adds considerably to the value of the proposition. A shaft sunk to a depth of 25 ft. on the neighboring mainland has struck a calcite vein yielding 275 oz. per ton. These discoveries have directed attention to the locality.

The preparations for hydraulic mining on the Nipissing or Carl properties at Peterson lake are going forward rapidly. Superintendent Linney has 90 men engaged and is adding largely to his force. The boilers and engines of the hydraulic plant have been installed and work will be started by the middle of June. The depth of soil will hardly average four feet, and the superintendent hopes to strip from 150 to 200 acres in the course of the season. It is probable that some of the other operating mines will resort to the hydraulic process. The Nipissing Co. has shipped ore valued at $1,200,000 during the last 15 months, and several carloads are stored in addition.

A large nugget of native silver has been found on the Rothschild property, south of Giroux lake. It is stated to be the second largest found in the camp. The claim where it was found immediately adjoins the Little Nugget, or Wiley location, which was recently sold to American capitalists.

The process of joint-stocking the more celebrated mines and putting the shares on the market goes on rapidly. The public, who have been hit so hard by wild-cat propositions in connection with British Columbia mining, is getting a little shy of mere prospects and calcite veins, but a going concern with a good shipping record has strong temptations for those who are speculatively disposed. The experience of the shareholders in the old Hudson Bay Stonnont mine—now the Silver Queen—who received 200% dividend on the first shipment of ore, which boomed the dollar shares to $60 and upward, has given a stimulus to speculation in actually producing mines. The famous University mine has been turned over to a joint-stock company with a capital of $1,000,000, the former owners retaining a large interest. The Cobalt Contact Silver Mines, Ltd., has acquired the Green property of 40 acres adjoining the Red Rock. They are incorporated with a capital of $300,000 and the members include John C. Quinn and George Lozensky, two experienced California miners. It is proposed to divide the property into single-acre blocks and lease alternate blocks as is done at Goldfield, Tonopah, Cripple Creek and other Western camps. They are selling stock extensively in New York.

The township of Coleman, which embraces the Cobalt mining area, has been constituted a special mining division under the new Mining Act. The regulations restrict the size of a claim in a 'special,' as distinguished from an ordinary, mining division to 20 acres, which is to be the limit of claims in future.

The Ontario government has brought action in the Courts against a number of holders of mining leases in the Cobalt area to have their claims set aside on the ground that they were fraudulently obtained by false affidavits of discovery. The first of these cases is now being heard by Justice Boyd of the High Court and the trial has already occupied several days and will continue for some time longer. The parties proceeded against are Edward C. Hargreaves, Bay City, Mich.; Frank Rutherford, Niagara Falls; Chas. G. Williams, Montreal; and the White Silver Mining Co., Toronto, who hold leases covering 200 acres of mining lands. It is claimed by the government that the prospecting said to have been done in November, 1904, and occupying some four days, was impossible of accomplishment as the ground was covered with snow at the time, and that the affidavits of discovery were consequently fraudulent. There are numerous other cases of the same nature to be heard, as large areas of Coleman township have been covered by blanket claims. Should the result of these trials be to declare these claims invalid and to re-open the land for prospectors, there will be great rejoicing in Cobalt, where the people have long been looking forward to the cancellation of fraudulently obtained leases.

There is great activity in the search for valuable minerals in northern Quebec where it is now ascertained that there is a mineral tract, probably of equal richness to the new Ontario mining region, of which in fact it is simply a continuation. Prospectors swarm along the Hudson Bay slope, all the way from Lake Temiskaming on the west to the region north of Lake St. John in the east. The particular quarter to which attention is now directed is the district north of Lake Chibugamoo, stretching toward James bay. The Chibugamoo Gold & Asbestos Mining Co., the principal interests in which are represented by J. A. Jacobs and Peter McKenzie of Montreal, have a number of prospectors out in that direction. One of them has just returned bringing back gold nuggets to the value of $4,000. The company maintain strict secrecy as to the locality where these were obtained and are losing no time in securing the mining locations. Other prospectors in their employ report the finding of extensive copper deposits between the Rupert and Nottaway rivers. The Grand Trunk Pacific Railway, now under construction, will pass about a hundred miles to the south of the Chibugamoo district, and its completion will be followed by a great rush to this region. Many representatives of British and American companies are now in the country in search of mineral deposits.

MELBOURNE, April 12.

A fire in the Broken Hill Proprietary mine, has, to use an old-fashioned saying, put one or two kettles on the boil. It was discovered in mid-February. The official account was that the carelessness of some workmen in not returning to see that everything was safe after firing a charge, led to the timber on the 400-ft. level catching alight. When the men did go back after crib, the gallery was full of smoke, and so, although there was plenty of water available, the seat of the fire could not be reached. Since then the management has been fighting the outbreak with varying success, and the speculative world of Australia has watched the battle with the keenest interest. The danger lay in the fact that just to the north of the fire and directly overhead, was a forest of Oregon pine used for square sets in the old days, when it was thought that a lode of such dimensions as the Broken Hill lode could be worked only on the square-set system. If the flames got into this ground the prospect ahead seemed to be the closing down of the mine indefinitely. As it is, one fire which broke out in 1897, is still smouldering and it is doubtful if the first, 1895, fire is out. These were both at the 400-ft. level, one to the north and the other to the south of the present outbreak. The width of the lode at the point where the fire started, and north and south of it for some 1,000 or 1,500 ft., is fully 200 ft.; as millions of feet of timber are contained in the crushed ground between the 400 and 300-ft. level, the risk of a vast conflagration can be gauged. The mode of attack was to clear the mine of gases by the use of blowers, sink water-shafts from the surface north and south above the seat of the fire; to cross-cut north and south of the area affected and to drive behind it so that water could be poured onto it from a number of different points. To the dismay of all, when everyone was hopeful that the outbreak was under command, flames made their appearance at McBryde shaft 100 ft. further south, and the attack had to be begun anew on a larger scale, water-curtains being provided north and south of the region, with the object of restricting the spread of the flames. It has been characteristic of the management that they never concealed from the public or from their shareholders the seriousness of the situation, and it is to the credit of the staff that they have at last apparently got the outbreak under control, though not without the loss of a life or two.

Concurrently with this outbreak was the fire on the Broken Hill Junction mine, some distance to the north of the Proprietary. The difficulties here were the same as at the Proprietary: A vast lode, broken ground filled with timber and the risk of the flames affecting the Junction North, the North Broken Hill and the British mines adjoining. How this fire originated is a mystery. But there are considerations in both outbreaks which may be stated. In the first place the purchasing of Broken Hill shares for London on a big scale had led to a lot of overselling of scrip. The question has been publicly asked whether there was any connection between this fact and the fires in the Junction and the Proprietary. Where cupidity comes into play anything may happen and it seems a queer coincidence that in past instances of fire at the Proprietary as in the present case, they have taken place on a Saturday or Sunday. Next, there are also stories that since the advent of British control in one or two of the mines at Broken Hill there has been some weeding out of hands. If that is so, all that can be said is that it is a dangerous thing to attempt in a place like Broken Hill. Further than that, the question has been raised as to the popularity of Messrs. Bewick, Moreing & Co. with the labor demagogues of the Commonwealth. The firm is very largely interested in the Junction mine, it has been responsible for the placing of a large block of shares of the Junction North Company with London capitalists, it is understood to have bought into the British, and it is known to have purchased shares of the North Company. There is no doubt that a vulnerable spot in the armor of the firm exists if a spirit of revenge or criminal cupidity suggests and carries into effect such wickedness as the setting alight of mines. What the effect on the market was could be gauged from the extreme fluctuations that took place in share-values. The steadying influence, however, was London, which seemed to buy regardless of whether there was risk at the Proprietary or not.

The last fact has given some coloring to the rumor that the aim of the Bewick-Moreing, Lionel Robinson and Baillien combination is to gain a controlling in-

fluence in the Proprietary company, so as to dominate its policy in respect to the production of zinc. The company turns out weekly about 8,000 tons of zinc-residue from its mill and it has an accumulation of 2,500,000 tons of the same material at the surface. Its output and its dumps therefore are equal to those owned by, or pledged to, the Zinc Corporation. Therefore so long as it is an independent unit the promoters of the Zinc Corporation have an element of danger ahead in the trade they hope to establish in zinc concentrate. The Proprietary directors, too, have a knack of moving in an orbit of their own. They are mostly men of a type that hold aloof from market combinations. Hence the feeling of security entertained in respect to them by the outside public and by their staff. They also are wonderfully well-equipped financially to go into a contest, as the company has big cash reserves, and in all probability possesses a still larger inner trading reserve. They can therefore work on as great a scale as the Zinc Corporation in the production of zinc concentrate, while in addition they have their lead and silver output from the mine as a main source of revenue. Apart from that, the zinc residue does not cost them anything. The Zinc Corporation has to pay from 4s. to 6s. per ton to the mines from whom they have bought before they start work, and should spelter go back to £20 per ton that difference would be very important. If these facts are taken into consideration it can be seen how great a gain it would be if control of the Proprietary could be acquired. Of course no one can state if this is the objective being aimed at. None the less persistent rumors in circulation entitle the subject to consideration and therefore the matter is discussed.

SALT LAKE, May 25.

The management of the Silver King Mining Co. has closed a deal for the purchase of the holdings of the Woodside Mining Co., at Park City, also the properties of the Ferry estate, consisting of 15 claims, making a total of 24 patented claims. The deal was a cash transaction. The Woodside mine, in the early days of the Park City district, was one of the principal shippers of that camp, and is said to have produced $1,000,000.

The first rails were laid a few days ago on the Salt Lake end of the Western Pacific railroad, the new transcontinental line now building between this city and San Francisco. The grading is completed as far west as the Nevada State-line, excepting 15 miles between the Jordan river, near Salt Lake City, and Garfield Beach on the south end of the Great Salt Lake. It is believed that the Salt Lake & Los Angeles line, operating from Salt Lake City to Saltair Beach, will be taken over to cover this mileage. The Western Pacific is already looking out for Utah feeders and has a corps of engineers surveying a route to tap the Deep Creek mining district, on the western border of the State. The branch will go to Clifton, about 35 miles from the point of divergence. At Clifton, several mines are developing. One of them, the Gold Hill, promises to become a large copper producer and is controlled by Duncan McVichie, manager of the Bingham Consolidated Mining Co., and associates.

The Carbonate Hill mine, near Peterson, Morgan county, has become a regular shipper of lead ore to the Salt Lake market. Mathew Dougherty of Salt Lake, is manager.

It has been announced from a reliable source that the Guggenheims have recently purchased stock in the Little Bell mine at Park City. Developments in this property since January have been important, and it is now rated as one of the camp's principal producers. Ore development in this mine and also in the Daly-Judge, has come opportunely. With such mines as the Ontario, Silver King and Daly-West showing depletion of their ore reserves and further development of them at depth made impossible, for the present, by the cave which occurred in the Ontario adit, some time ago, the new strikes have restored confidence and the future of the camp looks brighter than for some time past.

The Utah Copper Co. is rapidly making preparations to supply ore to its mill, now under construction at Garfield, which plant is destined to ultimately treat 6,000 tons per day. To make room for yards capable of holding 300 railroad cars at the same time, R. C. Gemmell, the superintendent, has ordered the removal of several of the mine buildings and has also arranged for the changing of the grade of the Copper Belt railroad tracks in that vicinity. One of the steam-shovels ordered some time ago will be placed in operation within the next two weeks, stripping the orebodies. The first 3,000-ton unit of the mill will be ready for operation in the fall.

At a meeting to be held in a few days, the directors of the Honerine mine, at Stockton, will decide upon the character of future operations at that property. The mill will probably be ordered started up again. Work on the drain tunnel progresses, it being in 10,660 ft. The directors of the Lower Mammoth Mining Co. have called an assessment of five cents per share, to provide funds for further equipment and development. The Boston Consolidated of Bingham has increased its shipments of sulphide ore, the same going to the new Garfield smelter. The management of the new Garfield smelter has announced that a portion of the plant will be ready for operation in about 30 days.

DENVER, May 27.

As the spring wears on, it is evident that this summer is to be one of intense local activity. Colorado has not had anywhere near the influx of outside capital for its mining industry during the last two years that it had prior to that time. At least the proportion of outside capital to local capital is a great deal less. It may be that there is just as much outside capital invested in the State as heretofore, but with a constantly broadening field the local capital is becoming more and more in evidence. This is a healthy condition of affairs and one to be encouraged. Foreign capital is a doubtful blessing to the mining industry. Where the investors live a long way off, the temptation to make money quickly by the use of deception is naturally strong. There is not much use trying to fool the local investor who has been in the mining business some time.

The American Mining Congress is making a determined effort to protect the small outside investor and it is to be sincerely hoped they may be successful. There is no good trying to conceal the fact that the mining industry lends itself peculiarly to the purposes of those men who are more enthusiastic than intelligent, more energetic than capable, and such men lead others into unsound investments. The very idea of buried treasure is alluring and the business of extracting Nature's riches cannot be too strongly safeguarded. I am sure all mining men wish the American Mining Congress success in its praiseworthy efforts.

Denver has just passed over one of those trying passes in the road to perfect self-government which beset every effort in this line. The city is administered under a charter which was provided for in a piece of legislation called the 'Rush bill.' That this bill was originally conceived as a means to better self-government no one will deny, but in order to get it through the legislature so many amendments had to be made, so many interests satisfied, that it is a most unwieldy instrument. One of its provisions was that no franchises should be granted except by the majority vote of the "tax-paying electors." No qualification of a tax-paying elector was specified and no provision was made whereby the tax-paying electors might prepare their own franchises and offer them to the best bidder. As a result the public-utility corporation framed franchises which were ridiculously liberal to themselves and then, it is pretty generally believed, they created a large number of "tax-paying electors" from among their friends. I believe the corporation managers do not deny this, and I see no reason why they should. The law simply states that the "tax-paying electors" shall have the right to vote on the franchises. If Mr. W. G. Evans of the Tramway or Mr. Doherty of the Denver Gas & Electric has a mind to sell John Smith a piece of real estate for $1 which is worth $10 because John Smith is friendly to their interests, it does not seem inconsistent with the law to consider John Smith a "tax-paying elector." Whether Mr. Evans or Mr. Doherty can be convicted of bribery is another matter. The fact remains that the "tax-paying electors" undoubtedly voted the Denver Gas & Electric franchise and probably voted the Tramway franchise, the plurality of the former being 895 and of the latter 183. The Tramway plurality being very small, it may be eaten away by throwing out such votes as were technically invalid for some cause or another.

The spring activity manifests itself prominently in the employment bureau advertisements along Seventeenth and Larimer streets. Yesterday I walked down that way looking for a laborer or two. I saw advertisements for more than 600 men. I did not get my laborer.

The Clear Creek basin is still keeping well to the front in enterprises. A shaft-building has been erected at the Gold Retort mine, on Quartz hill, Gilpin county. E. G. Straub of Denver is general manager. The Four-Mile Gulch Gold Mining Co. has just been incorporated to work claims on Democrat mountain, east of Black Hawk.—James McMillan of the North Star mine on Yankee Hill is making arrangements to start the new mill at once. It is a fine new mill with a crushing outfit of ten stamps.—A new ore-shoot has been discovered in the old San Juan vein of the Nevadaville section of Gilpin county. Jack Hawn and Henry Mayhew are the lucky lessees and there is no man in the district that has more friends to rejoice in his good luck than Henry Mayhew, who has been hauling other people's ore for many a year.

The popular prejudice against long cross-cut tunnels among intelligent mining men is yielding to a more reasonable view in the face of repeated discoveries in the several long bores that are being driven at present. The Vidler tunnel in the Argentine district near Georgetown has struck a body of ore which is reported to be the biggest strike of the year in that district. The Lucania tunnel has struck two small veins of nearly solid sulphide ore during the last two weeks. One was galena and one copper pyrite and strange to say they dip in such a way that they must cross or join together about 35 ft. above the tunnel. They both carry good gold and silver values. The Lucania tunnel has been averaging 5 ft. 8 in. advance per day. This is very good work for a big adit, but it has been beaten several times in this State.

The San Juan country has taken on its customary spring activity and many new enterprises are starting. The long tunnel through Engineer mountain is to be undertaken by the Pittsburg Tunneling & Development Co. The Hanna mine at Capital City has just completed an elaborate mill, including Blake separators for its zinc ores. This enterprise is of especial importance because the Lake City part of the San Juan country has a great deal of zinc ore and there seems to be no reason why it should not be successfully worked by the modern methods of separation and concentration.

BUTTE, May 26.

The East Butte Mining Co. has added 115 acres of mineral ground to its holdings in the East Butte section. The purchase was made a few days ago after long dealings through agents who secured the ground for $51,000. A portion of the surface was sold to a real estate firm for $20,000 for city lots. Several copper veins are known to run through the property, and five years ago, during the height of the Heinze-Amalgamated fight, when ground was worth more for purposes of litigation than for mining, the owners of seven-eighths of the ground demanded $500,000 for their interests, and they might have been able to sell at that figure but the other eighth was owned by persons hostile to the side that wanted to buy, and would not sell at any price. It is the intention of the East Butte Co. to sink a shaft on the ground as soon as the Dutton shaft, on which the company is now working, has reached a depth of 1,200 ft. After the agents of the East Butte Co. had tied up the seven-eighths, the original owners were offered $150,000 for the mineral rights alone, but the offer came too late. The Dutton shaft is now down 400 ft., from which level a cross-cut is being driven, and levels will be run at each 200 ft. in depth. Sinking will continue at the same time. In nine of the shafts tributers are mining, who in April paid the company $10,000 in royalties, representing one-fourth of the result of their operations. The output for May will exceed that sum.

The Cable Consolidated Co. has begun systematic development of its placer properties. The company owns about 700 acres of ground. The development of the latter, while extensive, does not exceed five per cent of the whole. This development shows that the pay dirt extends to a depth of 60 ft. It is now proposed to bore a test hole in every five acres of ground. It is estimated that this work will cost $12,000 and when it is completed systematic operation of placers will be carried on. Meanwhile the company is working its quartz mine and producing 50 tons of ore per day. Within the next two or three weeks the output will be increased to 110 tons per day by the installation of new machinery now being put in place. The mine has been yielding gold steadily for a number of years. It is the purpose of the new company to work it more extensively. The formation is limestone. The company's placers are 15 miles northwest of Anaconda, beginning near the upper end of the gulch where it is crossed by the big vein of the Cable mine, and extends down the gulch and along the creek a distance of three miles. The dredging ground begins at the foot of the tailing dump of the quartz mine and continues in a series of flats and bars to the lower end of the company's property. The lay of the ground and the width of the various flats make it a dredging proposition. The Cable mine is one of the oldest gold-producers in the State and has yielded millions of dollars from workings less than 200 ft. deep. The Cable Consolidated Co. was organized by a number of Pittsburg

capitalists and they took over the Cable Lease Co. and Cable Mining Co. interests in the property.

The shaft of the Butte & London Co. has reached a depth of 375 ft., of which 125 ft. is in bedrock. The new hoisting engine is being set up. The old engine is still good for greater depth, and the new one has therefore not been rushed to completion. The company will place four new boilers, a new compressor has already been ordered, and several new buildings are being erected.

It is stated that the Pittsburg & Montana Co. will not abandon the Baggaley process of smelting, but may enlarge the plant when the mines are sufficiently developed to warrant it. The company is mining 100 tons of ore daily and shipping it to the Washoe smelter earning $6 per ton net, whereas the company lost money by operating its own smelter with the Baggaley process. The plans to reorganize the company have given way to the proposition to issue $3,000,000 in funding bonds, which, it is claimed, have already been underwritten. The company's mines will be developed 200 ft. deeper in hope that larger orebodies will be found.

The stockholders and directors of the Columbus-Butte Mining Co. are not working in harmony. The company again finds itself in deep financial waters and the directors, who reside in Columbus, have decided to permit the options on the Jennie Dell mines to go by default. Local stockholders have invited the old subscribers and outsiders to take another big block of stock so that enough money may be raised to take up the options, which will expire July 1. It is expected that the officers of the company will refuse to issue the stock. The Butte shareholders are prepared for that by sending an agent to Columbus to demand the issuance of the stock, or to apply to the court for the appointment of a receiver for the company.

The shaft on the Eagle mining claim in Walkerville district has reached a depth of 125 ft. and is being sunk at the rate of five feet a day. The new engine has a capacity for sinking 500 ft. The showing at the bottom of the shaft is said to be good.—The Butte and Mount Haggin Co. has been incorporated for the purpose of developing quartz claims near Anaconda. The incorporators and directors are Charles Bostrom, G. Eckstrom, H. Benson and H. T. Hendricks, all of Anaconda.—Butte men have organized the Butte & Arizona Copper Mining Co. to operate mines in the Huachuca mountains, in Cochise county, Arizona, 16 miles from Hereford. Men interested are J. H. Vivian, J. E. Corrette, B. H. Dunshee, J. C. Adams, L C. Evans, D. M. Watt, C. S. Shoemaker, A. P. Pohndorf and A. G. Pohndorf.

La France Co. has started pumping water from the Lexington mine and expects to have the workings drained in about four months. As one of the levels is connected with the Alice mine the latter will also have to be drained to that depth through the Lexington. The Lexington will in a few years be a copper producer as the Corra vein of the Red Metal Co. has been developed to the end line of the Lexington and below the present workings of the latter.—The Butte Copper Exploration Co. has reached a depth of 625 ft. and is sinking at the rate of four feet per day.—New orebins are being built at the Berkeley mine of the Butte & Boston. The Snohomish and Tramway mines will be worked through the Berkeley shaft. The three mines have been closed for a number of years by injunction.—The new steel head-frame at the Leonard mine of the Boston & Montana Co. is up, and the new hoisting engine is being put in position.

The Alliance Copper Co. was organized in Butte a few days ago by J. D. Slemons, A. T. Morgan, J. O. Hodgens, C. J. Kelly, Malcom Gillis, Donald Campbell, and R. M. Cobban, all Butte men. The property of this new company is situated in the East Butte section and consists of a number of city lots with mineral rights.—The Butte & Michigan Co., developing claims in Leslie gulch, several miles southeast of Butte, is putting in a hoisting plant. A shaft, now 50 ft. deep, is being sunk on the Julian claim, and will be put down 500 ft. before further exploration is undertaken.—The East Butte Extension Co. has purchased a portion of the Centerville lode claim, the remainder of which is owned by the American Consolidated Mining Co., being organized by J. A. Coram. The Extension Co. is making good progress in sinking its central shaft in East Butte district and is shipping ore.—Copper ore has been cut in the shaft being sunk on the Greenleaf claim by the Boston & Montana Co. The Greenleaf adjoins on the east the property of the Butte Copper Exploration Co.—The Butte & Bacorn Co. has its hoisting machinery in place and several days ago renewed sinking its three shafts with steam-power.

DENVER, May 29.

The coming of the new mining camps seems to be outside the operation of natural laws. The 'discovery' generally comes unexpectedly, both as to time and place—like lightning from a clear sky. If the commercial law of demand and supply applied to mining camps, a new one is due in Colorado now, for on every hand the desire for it is expressed—not that the old ones are played out, but they grow stale and fail to attract speculative money. So urgent has become the demand for a new camp, that the Denver Chamber of Commerce has decided to send out prospecting parties. The undertaking is laudable and may result in acquisitions of productive territory; it will be interesting to note the result. At first thought it would seem easier for a body, like the Chamber of Commerce, to find a whole new camp, than for the old orthodox style of burro-and-bacon prospector to find a single mine.

Following exploitations and tests made during a period of about five years, it is announced that Rio Blanca county has a large area of oil territory, producing the best grade of illuminating oil, unexcelled elsewhere in the United States. The field is situated on an anticlinal fold of shale 3,000 ft. thick, covering oil-bearing sand of great depth. Two productive wells are each 2,500 ft. deep. The crude oil is said to carry 60% illuminating oil, 20% paraffine, 19% naphtha and 1% waste.

The large amount of territory in South Park, being acquired by a syndicate of mining men, under placer laws, has caused considerable comment as to the equity of wholesale absorptions of this character. It is stated that a large area in the vicinity of Hartsel is underlaid with a thick sheet of eruptive rock, carrying gold to the extent of $3 to $4.50 per ton, that yields readily to cyanidation.

The Moyer mine at Leadville is producing 300 tons daily. The extension of the Moyer ore northeast has been cut by the Tucson shaft situated on the crest of Iron hill. The ore was encountered at a depth of 900 ft. The orebody intersected is over 50 ft. thick of the same character as the Moyer ore, that is, copper and zinc sulphides.—The mine operators of Leadville are calling for larger smelting facilities in view of the fact that the American Smelting & Refining Co.'s works are running at about full capacity and the phenomenal bodies of ore uncovered by recent development.

The Tungsten mines of Boulder county, heretofore operated mainly by lessees, are to be worked by companies with sufficient capital to equip their properties and modernize the operations. Hitherto about three fourths of the output has been made by lessees. Capitalists are now taking hold of the business and a large increase of tonnage is confidently expected.—The Tilly Butzel mine of Boulder county has been sold to the Calura Mining Co. for $25,000.

Another pay-vein has been opened through the Newhouse tunnel in the Silver Queen ground. It is claimed that with several feet of mill-dirt, there is a streak of smelting ore eight to nine inches wide valued at $50 per ton.—The Pine Shade vein, also operated through the Newhouse tunnel, has developed a two-foot streak of lead ore carrying gold and silver to the extent of $20 per ton.—The Vidler tunnel above Georgetown has cut the Flossie vein, disclosing a mineralized shoot 10 ft. wide. Part of the ore can be sent to the smelter in the crude state, and arrangements are being made by Mr. Vidler to erect a 50-ton concentrator to treat the low-grade stuff.

On May 25 Portland stock dropped 42c. per share. The mine is credited with a total of 10,000 tons output for 24 days in May. The company is about to erect a 400-ton cyanide-plant to treat the tailing from the Colorado City mill. No verified statement, to explain the slump, is given. One rumor has it that shaft No. 2 has been abandoned on account of exhaustion of the ground; another, that litigation is pending.—The Stratton's Independence dump containing about 900,000 tons, has been sampled by sinking some 50 shafts through it. The object is to determine whether the estimated value of $5 per ton is constant; the intention being to erect a cyanide-plant for the treatment of this dump.—The April pay roll for the Cripple Creek district amounted to $700,500.

Although the higher altitudes of the San Juan country are not yet open to traffic, rapid progress is being made toward repairing the damage to property by snowslides and fire.—The Green Mountain mill is repaired; Mr. Franklin Guiterman, of the American Smelting & Refining Co., states that the Silver Lake mill will be rebuilt at once. The construction of the Camp Bird plant is progressing rapidly and all along the line unusual activity is displayed in rebuilding.

Telluride will be deprived of railroad communication with Vance Junction for several weeks on account of a landslide, which carried the roadbed some 30 ft. below its normal level.—The Ridgeway mine located in Maggie Gulch, San Juan county, and which has produced a fair tonnage of high-grade ore at intervals for eight years, is now being operated by lessees, who have developed an ore-shoot over five feet wide, that samples 10 oz. gold and 400 oz. silver per ton; the base is an iron sulphide.—It is stated that the Pittsburg Tunneling & Development Co., operating the Wyoming mine on Engineer mountain, will tunnel the mountain to a point above Animas Forks, a distance of 13,000 ft. This old district bids fair to see a renewal of the mining activity it experienced a quarter of a century ago.

LONDON, May 16.

A company has been formed under the name of Conrad Stannite Mines, Ltd., with a nominal capital of £500,000 in £1 shares. The vendors received 360,000 credited as fully paid for the property, consisting of 10 mining leases of a total area of about 294 acres, situated at Mayo, county of Hardinge, New South Wales, about 16 miles from Inverell and 510 miles from Sydney. Some of the leases have been worked and developed to a depth of about 400 ft. by the former owners and the company will consequently soon reach the producing stage. For this reason the small working capital of £15,000 is deemed to be sufficient. The machinery already in place includes the King Conrad mill, which contains trommels of various sizes, two rock-breakers, rolls and jigs. To these there have been added, for concentration by water, six Wilfley tables, six Frue vanners, and a Wilfley slime-table. Before smelting, for separation of the products, a Wetherill magnetic separator with dynamo has been supplied. The smelting plant comprises a new 30-ton water-jacketed copper furnace, with a Root blower, in addition to the existing 10-ton reverberatory reduction furnace and the three-ton slag-furnace for the treatment of the tin slags. The mill and other machinery are driven by a splendid tandem engine made by Morison and Beardley, of Newcastle, and steam is raised in three multi-tubular boilers of 35-h. p. each, and is capable of dealing with about 150 tons per diem, or, say, 50,000 tons per year.

At the statutory meeting Mr. Alexander Hill, of Alexander Hill & Stewart, the managers, gave a full account of the property and how it is to be operated. In describing the mine, Mr. Hill said it is one of the simplest possible propositions that could be presented. The country rock is granite, and the vein occupies a fissure in the granite. It is not very wide, varying from 20 in. to 2 ft. 6 in., but it is continuous. As far as the works have gone, there are no faults or breaks of any kind in the vein. At the deepest level, 400 ft., it is just as strong and well mineralized as it is near the surface, and, as there are hard walls, but little timbering is required, and the extraction of the ore from the mine is one of the simplest operations that could be found anywhere. The ore itself consists of a mixture of practically four metals. There is lead carrying silver; that is in the greatest proportion. Next comes copper pyrites, then stannine, or sulphide of tin, and besides that there is iron pyrite and zinc-blende; but the metals to which they look for profits are lead, silver, copper and tin.

Mr. Hill explained the methods to be adopted for the treatment of the ore. In the first place they would reduce the tonnage that goes to the mill a little by hand-selection at surface. They are also able to pick out by hand some of the rich ore—some lumps of pure galena and stannine. These are put on one side without further crushing, and they are fit for direct shipment; the balance is sent to the mill, where it is crushed, sized and eventually treated by water concentration. Two classes of concentrates are made. First the pure silver-lead concentrate, which is separated easily. This is similar to the lumps picked out at the mouth of the shaft, both products being sent to the nearest smelter. The second concentrate consists of a mixture of copper and tin, with a little galena and lead, which they had not been able to separate in the first place. This concentrate will be smelted at the mine. In the blast furnace the tin separates from the copper, and a white metal is obtained carrying almost all of the copper, with a very small proportion of tin and a little lead. The tin that comes in this matte is not paid for—that is a loss—but practically all the copper and also the silver that happens to be in this matte, and sometimes the lead, are paid for. Every 100 tons of ore, as sent to the mill, will give, roughly, about 9½ tons of this first-class lead and silver concentrate and prill ore, 11.8 tons of the second-class concentrate, containing copper and tin and a little lead, and 78.7 tons of tailing, that is, waste in the form of quartz.

As regards the smelting, Mr. Hill said, before the second-class concentrate is put in the blast furnace

it has to be calcined. The slags, containing tin, are then re-melted in a smaller reverberatory furnace, poled with green poles, and a tin-lead bullion is obtained. All the lead that happens to remain in the second-class concentrate goes with the tin into the slag, and they got from the tin furnace a tin-lead bullion which is a marketable product. There is a certain amount of tin in the final process which is wasted; but the result is that this tin-lead bullion is a sort of solder, containing 56 per cent tin, 41 per cent lead, and a little silver. That was the method formerly adopted, but since October last, some trials had been made in this country and in Germany, in order to see whether it was necessary to smelt the tin and the copper together, and if the tin and copper could be separated before putting it into the blast furnace; and by means of running it over a magnetic separator it was found that the second-class concentrate could be separated in two products—that is to say, the tin from the copper and the copper could be smelted into the matte alone and that the tin could be treated alone, instead of running the two through the blast furnace. Mr. Hill stated that there were 175,000 tons of milling ore in sight which he estimated would yield a profit of £366,-700.

'The Financial News' in its latest contribution on Cornish mining states that in 1866 the mining market in London knew 128 working Cornish mines, one-half of which were regular dividend-payers. Up to 1871 some astonishing results were shown by the tin mines of the County, especially those situated on the junction of granite and slate. The particulars of 13 of the leading mines derived from the financial list of that time show that on an aggregate outlay of £230,605, dividends were paid amounting to £3,207,940. The same list contains other remarkable records from which may be taken: Botallack, for £91. 5. 0 per share paid, stood on the market at £275 to £300 per share; Dolcoath £128. 17. 6, price £250 to £300; East Pool £24. 5. 0, price £320 to £330; South Caradon £1. 5. 0, price £325 to £375; Wheal Seaton £58. 10. 0, price £130 to £135. According to the authority quoted these and many other examples given "seem to show even under the primitive conditions then prevailing in Cornish mining, it was a very much less speculative business than gold quartz mining is in most parts of the world." The continued boom in tin would make Cornwall a veritable Tom Tiddler's ground were it not for certain deterrent influences against which the casual promoter of meager resources and poor reputation is helpless. Amongst these influences the preference of the landlords in granting licenses to local men of standing or well-known financial groups is one of the most effective. From this point of view the County is to be congratulated on the formation of 'Wheal Vor Limited,' the shares of which are offered this week in the first instance to shareholders of Dolcoath Limited. The capital is £60,000 in 10s. shares. The total area of the 'sett' (situated in the parish of Breage, near Helston) is stated to be large and the purchase price of the licenses is 24,000 shares credited as fully paid, for which also underwriting and other services in the flotation of the Company are included. The prospectus states that the mine was formerly worked to a depth of 295 fathoms, and is said to have yielded at one period one-fifth of the entire tin produce of the world, making a profit of over half a million sterling, when the price of black tin was between £30 and £40 per ton. The average price for the last three years for black tin of similar produce has been £79. 14. 6, and for the first four months of 1906, £102. 11. 9. It is not at present the intention of the Company to re-work the mine to its full depth, but to carry out the recommendations of the late Captain Josiah Thomas—that is, unwater the mine to 144 fathoms below adit and work the unwrought portions of the lodes, which extend for a distance of 250 fm. east up to the great cross-course from Borlase's shaft (which is vertical down to the 144-fm. level, and in good condition). The occurrence of rich deposits of tin ore where the lodes are intersected by cross-courses is stated to be a prominent feature in the history of mining operations in Cornwall. The lease will be held from General Jago Trelawney on what are considered very favorable terms, and based on a surface rent of £100 per annum, merging in a royalty. The directors are: Frank Harvey, Hayle; James M. Holman, Camborne; Gilbert B. Pearce, Hayle; and Oliver Wethered, London; they are directors of Dolcoath, and the manager also of that mine, R. A. Thomas, is the consulting engineer. Mr. Richard Pearce of Denver is one of the largest subscribers to the undertaking. The operation of unwatering and exploring old and extensive workings such as exist in Wheal Vor will be watched with interest by mining men not only in Cornwall but elsewhere.

MINING SUMMARY

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—Eastern capitalists have recently been in Benson investigating its smelter, and it is possible that one of the visiting party will take the smelter over and operate it. Don Merrill, in charge of affairs of the Southwestern Smelting and Refining Co., in Benson, says that the smelter will probably be started within six months. The plant is in first-class condition.—A good quality of coal has been discovered in Deerfield mining district. W. P. Blake, who has made an examination of the discovery, says the coal is of good quality and cokes well. There is a solid three-foot vein, which is being mined for the Chittenden reduction plant ten miles from the mine to which a wagon road is being made. The Gila River railroad will pass within eight miles of the new coal camp.

Phoenix, May 24.

GRAHAM COUNTY.

(Special Correspondence).—I. H. Knapp, who has been in charge of the timbering work in the West Yankee mine, at Morenci, for a number of years, has resigned to take charge of the San Juan group in the valley ten miles below Clifton. The San Juan Co. has been re-organized and new capital secured for development. A new mill is being erected at the property—A 500-ton smelter is to be built at Price's Station, on the Phoenix & Eastern railroad, ten miles east of Florence, at the junction of the Gila and San Pedro rivers. J. H. McCabe, of Phoenix, is at the head of the enterprise, and has associates in Los Angeles, New York and Boston.

Morenci, May 26.

The Shannon Copper Co., near Clifton, is running two furnaces and producing 1,500,000 lb. of copper monthly. In April its output was 1,312,000 lb., within 46,000 lb. of the largest previous month's production.

MOHAVE COUNTY.

(Special Correspondence).—The Arizona Birmingham Gold Mining Co., lessee of a portion of the Chloride Gold Mining Co.'s property, at Chloride, has cut a blind lead in the cross cut being driven to cut the Lucky Boy vein. The ore runs $60 per ton.

Kingman, May 26.

PINAL COUNTY.

(Special Correspondence).—W. M. Williams has gone to his mine, 10 miles west of Kelvin. This mine was located many years ago as a silver mine and was then known as the Ray mine. It carried also copper, but owing to the drop in silver was abandoned and remained idle until Mr. Williams re-located it.

Phoenix, May 27.

YAVAPAI COUNTY.

(Special Correspondence).—Two companies have been organized at Phoenix to dredge for placer gold on the Hassayampa river in this county. The two companies combined have filed on, and bought up, lands aggregating about 1,500 acres. They will prospect with boring machines.

Phoenix, May 27.

(Special Correspondence).—A large body of gold ore has been opened upon the Rainbow group belonging to the Baltimore and Arizona Copper Co. in Turkey Creek district. The deposit in a north-south direction measures 1000 ft. with an average width of 300 ft. The ore is sulphide carrying from 2½ to 5% copper, 20% iron, with gold and silver. The deepest work on the ground is a 75 ft. shaft, upon which the company will place a hoist. A compressor and machine-drills will also be installed.—It is announced that the Coronado mine at Martinez will resume operations, after a long shut-down. The property is well developed.

Prescott, May 24.

At Oro Blanco some important developments are reported. The Arizona Consolidated Mining Co. is sinking on the Oro Blanco mine. The shaft is down 250 ft. and is in a 12 ft. vein of gold ore.—At a depth of 450 ft. a vein of rich ore has been struck in the Sorrel Top. O. C. Foltz is opening a copper prospect on which he has sunk 250 feet.

CALIFORNIA.

BUTTE COUNTY.

The Bloomer Hill quartz mine, situated in the Berry Creek mining district, is to be re-opened. A. B. Chambers, the owner, has bonded the mine to San Francisco capitalists. A number of men have been at work putting the mill in shape.

EL DORADO COUNTY.

W. F. Almy has two disintegrating mills on his properties at Smith Flat, the Alcemento and Alceviro mines. The mill of the former has been in operation about two months, while on the latter a new mill is in process of construction and is almost ready for operation.—Well-boring drills are working on the Roundout mine, recently bonded by I. H. Bingham, and on the property recently held by Plummer and Swansborough. The first drill on the latter property reached a depth of 100 ft. a few days ago.—The Union mine, four miles south of El Dorado, is running, employing thirty men. Twenty stamps have been dropping at this mine during the past month. D. Humbert, who is now in possession of the property, is managing owner.

MODOC COUNTY.

(Special Correspondence.)—The Hogue mining district, near Fort Bidwell, is now being thoroughly prospected by men from all parts of the country, who are following up the receding snow line on the mineralized belts, and are finding rich float. Many new locations are being made. The snow on the main divide was going fast until checked the past week by eight inches of snow.—During the last few months the people bonding the Wade Plummer claim have sunk a prospect shaft 50 ft. deep near the contact, and cut some good ore. The work was made expensive on account of the deep snow and has been suspended.—Several long tunnels were planned and partly run on the lower part of the Pine creek side three miles west of Wade Plummer, last winter, but the work was not finished, as is often the case with this kind of development, and no results were obtained.—The Mopin Sunset has established a camp just below the snow line and is beginning to sink and take out ore, which on the surface is 50% free. The vein outcrop is large. Some good ore is being obtained.—The Kafader, a small rich vein of crystallized quartz in porphyry, prospected to a depth of 12 ft. and will be developed by a tunnel run to tap the vein 100 ft. below the present outcrop. Several men are working on the extension of this vein.—Work is being done on the Williams & Turner location where they have found tellurides, partially weathered and showing gold.—The people owning the Dismal Swamp claims on the Oregon side are establishing a camp to do prospecting and development.—The Mine Venture Syndicate is doing preliminary prospecting on their large tract of patented ground with a view to leasing it in small tracts, as some high-grade ore has been found in the dikes on the surface near the Wade & Plummer ground.—This camp will probably be developed and worked largely by the leasing system for the present, and later be taken up by companies. The conditions are favorable for this method of development and operation.—The county has finished a survey for a wagon road on a six per cent grade from Fort Bidwell up the Main creek to the North Fork, a total distance of seven miles, the terminal to be where most of the men are located and within a few miles of all the more important prospects.—The most interesting find during the last month is some hard black float carrying a large amount of silver and some gold.

Fort Bidwell, May 22.

NEVADA COUNTY.

Work has been started on the new tunnel at the Gaston mine, which it is estimated will require from two and a half to three years to complete. The tunnel starts from Poorman creek and will strike the ledge at a depth of 2,000 ft. in a length of 4,000 ft. The contract has been let to Victor Redmayne who is working three shifts of three men each. A compressor and power drills will be put in. Meanwhile work in other parts of the property will continue as usual. A force of 100 men is now employed at the Gaston mine.

PLACER COUNTY.

The Goldfield-Tokop Mining and Milling Co. has bonded the Black Hawk mine, also known as the Pedlar mine, in Humbug district near Damascus. The mine is an extension of the Pioneer mine. R. E. Whitcomb, secretary of the Goldfield-Tokop Co. has been two weeks getting things in order for work. The company has leased the ten-stamp mill of the Southern Cross mine close by and is building a tramway to the mill. About 900 ft. of tunnel have been run by the original owners.

SHASTA COUNTY.

A number of Greek laborers working at Quartz Hill near Redding, have formed a company and now have control of the transportation of ore, having several teaming outfits. The ore from Quartz Hill is hauled by teams to Keswick and loaded on cars for shipment to the Mammoth smelter at Kennett. Sixty tons are shipped daily.

SAN BENITO COUNTY.

The New Idria quicksilver mines are about 45 miles west of Coalinga, with which place they have recently been connected by good wagon road. Fuel oil from the Coalinga field is to be used at these mines. The present production is said to be 125 flasks per month. Foundations have recently been laid for a new reduction furnace. Of the numerous quicksilver prospects in that section, one is being opened by the Barton brothers of Hanford. It is situated about one mile up the San Benito canyon from the road that leads to Hollister. They employ two miners and expect to operate extensively soon. A good water-power is available in the canyon. When cheap fuel is available, on the completion of the contemplated pipe-line, many mines now idle in this district will be worked.

TUOLUMNE COUNTY.

At a prospect shaft near the Grizzly mine, a mile from Carters, Fred Nicholls, a miner, was the victim of a most unusual accident a few days since. He was removing the lid from a box of detonators, when the cars exploded in his hands, seriously, if not fatally injuring him. It is supposed in twisting the lid of the tin he gripped the body of the box so tightly as to cause the fulminate to explode.

(Special Correspondence).—Another boiler and a large pump will be installed at the Louisiana mine, near Tuolumne, it being impossible to make satisfactory progress in unwatering the property with the present equipment.—The Pyrenees Gold Mining Co. has commenced work at the Patterson mine, near Tuttletown. A new track is being laid in the south drift, which is 300 ft. long and said to expose good orebodies. The buildings have been repaired and a blacksmith shop is to be erected.—Rich ore is being extracted from the Maddox mine at Confidence and shipped to Selby. Assays run over $100 per ton. The fissure is five feet wide. The rich ore is on the hanging-wall side and is two feet wide. No free gold is found. On the footwall the vein is one foot wide and carries free gold. The mine was bonded by Jos. Maddox, Sr., to Jos. Maddox, Jr., and W. H. McPherson about a year ago, when only a prospect. A cross-cut 200 ft. long has been driven to the vein and drifting both ways is in progress—San Francisco parties have examined the Buchanan mine, 12 miles south of Sonora, on the divide overlooking the main Tuolumne river, and it is reported that it will be re-opened. The mine has several veins, the principal one running east-west. It is opened to a depth of 700 ft. by shafts, but can be cut by a tunnel driven from the river, 2,000 ft. below the apex.

Tuolumne, May 29.

COLORADO.

CLEAR CREEK COUNTY.

Arrangements are being made to resume work on the Gold Fissure group, owned by Massachusetts and Rhode Island people. George A. Bristol, treasurer of the company, says ample funds to work the property are available. The entire group of six claims is to be exploited. This work will include the driving of a cross-cut from the shaft to the large deposit of ore uncovered recently in the old workings on the Gold Fissure vein. The comparatively small area stoped has yielded a net sum approximating $90,000.

GUNNISON COUNTY.

Archie McLeod of the Jim Blaine mine at Gothic reports five to ten feet of snow still in that neighborhood.—The Anthracite mine of the Pueblo Fuel Co., at Crested Butte, has started up after a shut-down of two months. The breaker now has a capacity of 100 tons per day and employs 25 men.—M. A. Pennington and Dan Dwyer have gone to their mines on Ruby peaks, prepared to do extensive development work this summer. W. Runnoe and W. McGlothlen took their outfit up on burros from the Buttes. If things are favorable this company will put in machinery and employ a large force this season.—The Gold Links has started up on the tunnel now in 1,700 ft. and A. E. Reynolds intends to go as much further. J. F. Pearson is superintendent and estimates that the Sacramento vein will be cut inside of four months

OURAY COUNTY.

Work at the new Camp Bird mill is progressing. The frame is under way and the hauling of machinery has been commenced. At what time the mine will be again in operation it is, as yet, impossible to say.—Ore is being brought down daily in large quantities from the Revenue. Nearly all the men laid off the past weeks have been replaced.—Work, which has been delayed on the property of the Ouray City Mining Co., will now be pushed.—It is said that nearly all the men who were at work at the Camp Bird mine and mill at the time of the mill's destruction by snowslide, will be given the positions they formerly held, upon the mill's completion.—At Telluride the completion of the Meldrum tunnel to the principal veins crossing its alignment is attracting much attention. A compressor and machine-drills are being considered. The tunnel is still being done by hand work and progress is slow. The Columbia-Menona vein is still 1,400 ft. ahead of the face, after which comes the Argentine, Black Bear, Tomboy and Japan-Flora, and all of these veins, and others, could be worked through this tunnel. On the Red Mountain side, several tunnels started have for their objective point this same territory, but the distance to the veins is greater on that side.

SAN MIGUEL COUNTY.

George R. Pickett, discoverer and manager of the Carbonero, is preparing to re-open the mine. It has been closed two months owing to running cut of supplies. The Carbonero produces shipping ore which is treated at the Salida smelter. Frank L. Ross, H. H. Stevens, Wm. Strieby, John R. and George B. Pickett are the owners.—A car of high-grade ore was shipped to Durango last week by the Pandora Mining & Development Co. This was an experimental shipment to determine whether shipping direct, or milling and concentration is the best practice.

TELLER COUNTY.

The work of filling the big stope on the Emerson vein of Stratton's Independence mine on Battle mountain is progressing, and it is calculated by the management that another week will see it completed. The stope is 185 ft. deep, one of the largest in the camp. It was worked so near to grass-roots from the 200-ft. level that the ground began to cave toward the south end of the stope, and there was danger of the precipitation to the bottom of the trains of the Midland Terminal railroad, whose main line was operated across the stope. For several months the railroad company has been compelled to abandon its main line and run trains, including switching crews, around by Goldfield. The railroad company has joined with the Independence people in the task of filling the hole. Several lessees are still working in that portion of the mine, but all the ore has been taken from the big stope.—It is reported that the Portland Gold Mining Co., at Cripple Creek, will build and have in operation before October 1 a 400-ton cyanide plant in addition to its mill at Colorado City. The addition will cost $75,000 and will be built to treat tailing from the chlorination mill. There are about 400,000 tons of low-grade tailing on the mill-dump which it believes it will be able to treat profitably by the cyanide process.—The fifteenth level of the Findley mine is unwatered for the first time since August, 1903, and men are breaking ore on that level. This vein was opened for 500 ft. and when the mine was closed in the strike days, 170 ft. remained to be developed at the south end. The ore-shoot is 800 ft. long—one of the largest in the camp. The grade of the ore is good, averaging nearly two ounces. By the time the Findley begins shipping in October, when the company's new mill at Colorado City will be in operation, its output will be sufficient to keep the mill running for a year without further development. No ore is being hoisted at the present time except that necessary to facilitate development. The Stratton Estate mines are among the large shippers at present; lessees on this property are doing well. Among the best shippers of the estate are the Abe Lincoln, eight cars per week; Orpha May, seven cars; American Eagles, seven cars; Deerhorn, four cars; Specimen, five cars, and the Lucky Gus, three cars. This does not represent the entire output, as numerous small lessees are working on the 250 blocks of the estate and many of them are getting out regular shipments of ore. Between 4,000 and 5,000 tons of ore are being shipped every month from the Stratton properties.

IDAHO.

ADA COUNTY.

The Old Ironsides mill in Black Hornet district, 10 miles from Boise, was destroyed by fire last week. The plant cost $28,000 several years ago. The property belonged to the Victory Mining Co. and was under lease, with option to purchase, to H. Adams of Boise. A force has been employed most of the winter, taking out ore. C. Nelson is in charge and expected to start up the mill in a few days, on ore mined during the winter.

BLAINE COUNTY.

Swanson's Independence group of eight claims, on the divide between the East Fork of Wood river and Elkhorn gulch, was sold last week for $60,000 to H. J. Allen, for himself and New York capitalists.—C. B. Dunton of Portland, Me., president of the Carbonate Hill Mining Co. is at Galena making arrangements to resume operations at that property.—J. A. Orr of Port Jarvis, N. J., president, and F. C. Kaye of New York, treasurer of the Lipman Mines & Tunnel Co., are at Hailey looking into the company's affairs

ELMORE COUNTY.

The Minerva mill, at Atlanta, has been running on high-grade ore. The larger portion of the gold was not saved on the plates. The tailing was banked, to treat in a cyanide plant recently completed.

LATAH COUNTY.

The directors of the Blue Grouse Mining Co. have decided to develop the property. The Blue Grouse is nine miles from Wallace and has been idle for six years. It is a lead-silver property and has three adits. One is in 137 ft., another in 778 ft. and the lower adit on the creek-level has just been started. It is the intention to drive this adit on the lode, gaining a depth of 1,500 ft. The adit now shows ore carrying eight per cent lead.

LEMHI COUNTY.

The Yellow Jacket mine, after being shut down for 10 years, will be started up July 1. The mine is equipped with a 60-stamp mill with water-power, tramway and sawmill. A large amount of ore is developed. It is said the mine was shut down as a result of failure of the owner.—The Queen and Crescent Mining Co., operating the Queen of the Hills mine near Lemhi, in a cross-cut tunnel, at 1,038 ft., broke into fine ore, and the miners have driven 10 ft. into the vein, without reaching the farther wall. The breast is 405 ft. from the surface.

SHOSHONE COUNTY.

The labor problem is still one of importance to mining companies in Coeur d'Alene district. At the Morning mine 60 machine men are wanted, but are not available. New miners, machine men, muckers, timbermen and millmen are being put to work every day, and the supply does not meet the demand. Miners throughout the district are paid $3.50 per day; machine men the same. Muckers in the mines directly contiguous to Wallace receive $3.50 per day, but in those about Wardner and Kellogg, $3 is paid, consequently there is more demand for muckers at Wardner than at Wallace. Experienced timbermen are always in demand, and are paid $4 per day. Millmen, in the concentrator plants, are in demand at $3.50 per day. On the south side of Coeur d'Alene district, of which Wallace is the center, 3,500 men are employed by the mining companies. The employees on the north side would bring the total to over 4,000. These men receive an average of $3.50 per day. The Federal Mining & Smelting Co. has on its pay roll 1,300 men in its mines and mills. The Morning mine, of the Federal Co., is a hard mine to keep supplied with men. Every day men are leaving the mine, and a man out of work hesitates before accepting a job in the Morning, owing to the fact that the mine is extremely wet and cold, especially at this time of year, otherwise, the Morning is all right, say the miners. Conditions generally under which men work in this district are said to be above the average in mining regions. The bunkhouses are, as a rule, kept in good order, good dry rooms are provided at every mine for changing clothes, and the board is good. Most of the mines, too, are dry.

Following is the official report of the output and net profits of the principal mines of the Coeur d'Alene district, handed in by the several companies to the county assessor in compliance with the State law:

Company.	Tons of Ore or Concentrate	Gross Value	Net Profit
Bunker Hill	342,414	$4,586,112.84	$1,957,477
Federal (4 mines)	904,004	5,962,385.59	1,565,218
Hercules*	11,422	943,306.96	375,349
Hecla	97,366	871,449.38	363,125
Snow Storm*	65,500	834,825.03	245,267
Frisco	1,125	64,457.11	.....
Coeur d'Alene Development Co.	75	3,204.49	.....
Gold Hunter	41,634	143,207.59	.....
Total	1,463,540	$13,408,948.99	$4,506,436

* Crude ore only.

As indicated above the complete returns are not yet made. These returns are from those companies making a net profit, but takes no account of those operating and making a substantial output, but without profit. Among these are the Pittsburg (California), Stewart, Success (Granite), Rex (Sixteen-to-One), Tamarack, Monitor, Idaho-Montana Summit (Black Horse), and Monarch, all shipping more or less ore and possi-

bly some others. The jiggers on Canyon creek, the South Fork and Milo creek also shipped approximately 1,000 tons of concentrate worth about $50,000.

NEZ PERCE COUNTY.

The Crackerjack mill is to start on May 15. Recent development at the mine has opened up a fine body of ore. A sufficient water supply is reported available. The Crackerjack is equipped with a 10-stamp mill, and 30 tons of ore will be handled daily. The electric plant which provides the power, cost $18,000.

MICHIGAN.

HOUGHTON COUNTY.

Owing to the settling of the ground the Atlantic mine has been compelled to suspend production entirely and operations at the mill have been discontinued. The subsidence of the ground in this mine has been in progress for several years, but during the last two years it has been more pronounced than formerly. Numerous expedients have been adopted to keep the shafts in commission and prevent a general shutdown, but the hanging and foot-walls of the lode in the shafts have come together to such an extent that the skips cannot be operated. It is uncertain when the Atlantic will be able to resume. A short time ago the Atlantic closed its B shaft to permit retimbering. This work is still in progress, and it will be at least six weeks before it is finished. More recently shaft D went out of service. There has been a change in the system of mining in the Atlantic during the past two years. The new method is to drive as rapidly as possible to the extreme limit of the productive territory, both in the shafts and drifts, in order that extraction might be started at these points, and then permitting the walls to come together as the subsidence of the ground progressed.—J. H. Jasberg and Charles J. Tolonen have secured an option on 500 acres of land, four miles west of Hancock, upon which a copper showing has been exposed. Three pits have been sunk in the vein, each to a depth of 10 ft. and rock resembling amygdaloid and containing copper has been exposed. A diamond drill may be employed to determine if the formation is a lode in place. At the Arcadian a four-foot veir of epidote carrying copper, lying 35 ft. east of the vein on which development is in progress, was encountered a few days ago. The new lode was found in a cross-cut being driven eastward to cut an amygdaloid belt that is known to parallel the main vein at a distance of 100 ft.—There is an improvement in No. 2 shaft of the Mohawk mine. After passing through many levels that contain barely enough copper to pay expenses, the shaft is now in pay rock.—At the Osceola Consolidated operations are confined to the two most southerly shafts. No. 6 is down to the 41st level and work is under way in the drifts from the 30th to the bottom. There are 40 drills in operation and rock shipments average 1,050 tons daily. A new model of skip has been put in use by the Osceola Consolidated, which is expected to eliminate the trouble, particularly in No. 1 shaft of the North Kearsarge branch, resulting from skips jumping the track. Preparations for this installation at No. 1 shaft have been in progress for a long time. The new skip is a radical change from the model formerly in use. The axle and hub, which were underneath the skip lifted the body of the skip from the track over half the diameter of the wheel. These are abolished and the wheels revolve on hubs projecting from lugs riveted to the side of the body of the skip, which permit the skip to ride down close to the track.

MONTANA.

FERGUS COUNTY.

E. W. King of Bozeman, one of the chief owners of the Barnes-King mine at Kendall, says the mine is in good shape and paying dividends at the rate of $12,000 per month. In three years the mine has paid $550,000 in dividends. Mr. King is also interested in the Alder Gulch Mining Co., owning mines in Choteau county, Mont. These mines are operating a 100-ton cyaniding plant.

GRANITE COUNTY.

The sale of the Hawkeye group in the vicinity of Phillipsburg, to J. D. Haines of Butte, and the bonding of the Mountain Ram group to Butte and Colorado parties are reported. According to stipulations, a mill and cyanide plant are to be built on the latter property before the close of the year. There is also much activity near Hasmark, where lessees are shipping and every available team is kept busy hauling ore.—T. E. Mitchell and John Mullen, who have a lease on the Brooklyn and Gem mines at Hasmark, shipped two cars of ore last week from the Gem. They have been at work only a short time. Their first shipment amounted to 50 tons. Henry Steber and Fred Kelly are leasing at the Peter Coyle property just below Hasmark. They have a two-foot vein of solid galena that assays well.—Redman and Jarvi last week shipped a car of ore from the Moroney tunnel.

LEWIS AND CLARK COUNTY.

The threatened shutdown of the East Helena smelter has been averted, the men employed in the sampler, who went out some days ago, returning to work pending a settlement with the company. The men have been working 10 hours in the sampler, and quit because a request for shorter hours at the same rate of pay was not granted by F. M. Smith, manager. During last week all of the furnaces at the smelter, except one, were blown out and arrangements were made to ship the ores that were accumulating to Salt Lake and Denver.

MADISON COUNTY.

C. B. Ward, who has been cleaning up around the old Watseka mill at Rochester, says that he will make money out of the deal. He has cleaned up and sacked eight tons of concentrate, dust and ashes obtained by sweeping the mill and burning old sacks, that will run close to $60 per ton.

SILVER BOW COUNTY.

The Washoe smelter of the Amalgamated Copper Co. at Butte during the past year has brought the capacity to 9,000 tons per day, and B. B. Thayer announced several days ago that this would be increased 500 tons.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—On Thursday a miner, on Main street, exhibited some specimens of free gold, and stated that he had secured the samples from his property five miles south of this camp. The news spread through the town, and all made haste to go to the scene in the hope of locating something. The locators of this new strike have named their camp Bronx. It is at Indian Springs, four and one-half miles southerly from Manhattan. On three claims, the Empire No. 3, Empire No. 4 and Empire No. 5, good ore is reported. This part of the district is known as the granite belt, and huge porphyry dikes cut through the granite. These dikes are mineralized at various places. The veins uncovered range from 4 to 16 feet in width.

Manhattan, May 27.

DOUGLAS COUNTY.

(Special Correspondence).—At Buckskin, the new camp near Mason Valley, the citizens recently held a mass meeting to take action looking toward the prevention of destruction of claim monuments, and the ante-dating of certificates of location by claim jumpers. Active prospecting is in progress and encouraging results reported. Near Buckskin a newer camp is striving for metropolitan honors with the older camp. This new place is called Mountain View. It consists of a large and airy townsite. The only mining in progress in the new city is the sinking of a well in hope of finding water, but with the usual luck in such cases, gold-bearing gravel is reported at a depth of 50 ft. There are veins in the adjacent hills and some of these are said to prospect. A survey recently made has determined that Buckskin townsite is in Douglas county and not in Lyon county as previously supposed. The mining and agricultural interests have combined in the effort to secure a railroad through Mason Valley. On the Redtop claim three shifts are now working and other claims are being prospected by their owners.

Buckskin, May 28.

LANDER COUNTY.

F. Pedroncini, J. Zonino and W. Suichetti, who have been operating in Crow canyon, three miles south of Austin, have uncovered a three and one-half foot vein of silver-gold ore. At a depth of 63 ft, the water level was reached and the chloride ore gave place to sulphides. Here the ledge, with solid walls, contains a 14 in. streak that assays $1,000 per ton silver, and $148 gold. The three Italians have been operating the property alone, but they have made enough from two small shipments to work it upon a big scale.

LINCOLN COUNTY.

(Special Correspondence.)—Johnnie, both town and district, is developing rapidly. The streets are being graded. The new automobile road to Station No. 73, distant 12 miles, is completed, and mail to this place will come via Las Vegas and the Clark railroad as soon as arrangements can be made to deliver mail to the auto line, now running between this place and the end of the road. Switches, tanks, telegraph office, and all necessary belongings to a railroad station are being provided. The steel gang are away toward Bullfrog laying rails as rapidly as possible, hoping to beat the Santa Fe. Good finds are reported from all sides. Mines are being bonded, sales made, and lessees are sacking ore for shipment. Some New York parties left here this week to make final arrangements to put in a mill and cyanide plant to work a gold proposition with a large body of ore in sight, and work is to begin at once. Lack of water is the greatest drawback to this locality. It can be had by piping from the Spring Mountain range, five to ten miles east of here. Timber can be had from there also, but gasoline engines will be the chief source of power throughout this desert country for some time and smelting with crude oil may come in time.

Johnnie, May 24.

(Special Correspondence).—The Searchlight Northern Railroad is rushing work and the hardest part of the entire road is now graded. This part, which is near Manvel, was practically all rock work. After the first four miles the natural road bed will be followed and work will progress rapidly. The depot site for the terminus is on the Cyrus Noble ground.—A new company, called the Searchlight Southwestern, has been launched. The ground of this company is situated southwest of the Searchlight Mining & Milling Co. and is considered a promising prospect.—As a result of the recent visit of the president of the Santa Fe and Saturn Mining Co. these properties will undergo a general change. A larger pumping plant will be installed in the Santa Fe, and on the Saturn the 100 ft. double-compartment shaft will be sunk to 1000 ft.—After sinking for some distance in barren matter on the Fraction shaft of the Duplex Co., the shaft is again in ore, of better grade than that encountered the first 100 ft. though this 100 ft. netted the company $30,000.—Several contracts have been let on the Nevada Searchlight, work is progressing, and the showing is improving with depth.

From Dupont and Newberry districts excellent reports are coming. Both of these districts lie in a belt twelve miles east of Searchlight and the work of development on the properties there is meeting with encouraging results. Specimens brought in from both these districts show gold. These outlying districts are all anxiously awaiting completion of the new railroad into Searchlight in order to reduce the cost of operation which has been a serious drawback up to this time.

Searchlight, May 21.

NYE COUNTY.

(Special Correspondence).—There are five leases being operated on Stray Dog at Manhattan. All are sacking and shipping ore to the smelters. Returns on Lease No. 3 show a good average on 10 tons, and on the dumps of this lease there are sacked for shipment 20 tons of the same character ore. On Lease No. 1 of the Stray Dog, John D. Campbell reports 500 tons of ore blocked out. On this lease, at the 108-ft. level, they have one and a half feet of ore that it is claimed will run $175 per ton.

A strike was made a few days ago on the Virgin Mary Fraction of the Manhattan Consolidated Extension Mining Co., adjoining the Manhattan Consolidated. At a depth of 60 ft. a 12-ft. vein of ore was cut showing gold. The ore is schist with stringers of quartz. Work in the shaft of the Manhattan Consolidated was stopped a few days ago at a depth of 75 ft. owing to a large flow of water, and work cannot be resumed until pumps are in place. Water is now assured for the contemplated mill. Two hoists are in the course of construction on the Consolidated. The dry washer which is at work on Lease No. 3, of the Cowboy is giving satisfaction. The dirt is thrown on a screen at the top of the machine, sifted onto a shaker, then deposited on riffles. A bellows sending an intermittent current of air across these riffles blows off the sand, the gold being deposited at the bottom. Considerable iron is also caught and the gold is separated by quicksilver after being taken from the riffles.—On the Raycraft lease on the Little Grey, a 12-ft. vein of good-grade milling ore has been encountered.—The hoist on the Mustang claim is ready for service. Good milling ore is being taken from the shaft on this property.—The drift from the shaft on the Georgey group of the Manhattan Nevada Gold Mines Co. is in 41 ft., and the entire face is in ore. The large black quartz ledge seen on the surface has not yet been encountered. It is expected that the next five feet will reach it.—A contract for a 50-ft. shaft on the property of the Manhattan Express Mining Co. has been closed.—The Manhattan Georgey Extension Mining Co. has been incorporated. The company's holdings adjoin the Georgey group at Central. Development will be started on the Oregon Fraction.—The tunnel on the Consolidated Manhattan, at East Manhattan, is now in 52 ft. in milling ore. They have tapped four veins. That at the face of the tunnel

is the best encountered, and pans free gold.—Work on the Buffalo is progressing. This property, the Consolidated Manhattan, and the Manhattan Mammoth are supposed to be developing the same vein.

Manhattan, May 24.

TEXAS.

PRESIDIO.

(Special Correspondence.)—The Texas Almaden Mining Co., at Terlingua, are now running ore through their new 20-ton furnace and have recovered 15 flasks of quicksilver after having fired only 21 days.—The Chisos Mining Co. are operating the leased Coquitt Tignor 10-ton furnace continuously and have installed a new gasoline hoist at the mines.—In the Marfa & Mariposa Mining Co.'s Mariposa mine an open fracture was encountered in one of their lower levels; through this fracture issues a strong blast of air. The fracture must be at least 50 ft. long to connect with the nearest workings.—— On the Lone Star property, good ore is now being taken out, and they will soon start their retorts again.

Coal developments are attracting a great deal of attention in this district at the present time. T. P. Barry and associates, who are using a diamond-drill in exploring their property, speak very highly of the results they have obtained, and the rumor is prevalent that a railroad project is well under way for this district.

OREGON.

LANE COUNTY.

An air compressor and drills are to be placed at the Doctor mine, in Blue River district, owned by C. F. Candiani, of Portland. Dr. Candiani has men running a 350-ft. cross-cut tunnel at the Doctor mine at a depth of 400 ft. As soon as the ore is opened up a stamp-mill will be installed. It is thought this will be done sometime this summer.

WASHINGTON.

STEVENS COUNTY.

Sparks' brothers of Kettle Falls have bonded the Benvenue group to Spokane parties who will put in a steam hoist and work double shifts. The owners have shipped three carloads of ore while doing development which has netted more than $40 gold per ton. The property is situated five miles southeast from Kettle Falls.

CANADA.

ONTARIO.

At the Micmac mines the drifting for the month of April is reported to have opened up something over $100,000 in ore. What the management believes to be the record for drifting in quartz and whin-rock (dike), was broken in the 300-ft. level east during the month. This drift was driven 101 ft. in 26 double shifts with a 2¼-in. machine drill, handled by one man. The cost for running this drift was $2.35 per foot, including its proportion of the pumping and hoisting expenses. The 15-stamp mill is running night and day on quartz taken out in development work.

BRITISH COLUMBIA.

Boundary ore shipments for the week ending May 19, were somewhat smaller than usual, the figures being: To Granby smelter, from Granby mines, 14,505 tons; from Skylark mine, 30 tons. To British Columbia Copper Co.'s smelter from Mother Lode mine, 2,240 tons; from Emma mine, 66 tons. To Dominion Copper Co.'s smelter, from Brooklyn-Stemwinder mines, 2904 tons; from Rawhide mine, 396 tons; from Sunset mine, 693 tons. To Nelson smelter, from Emma mine, 198 tons. Total for week, 21,032 tons; total shipped for year to date, 484,911 tons. Boundary smelter treatment of ore was as follows: Granby smelter, 15,986 tons; British Columbia Copper Co. smelter, 2719 tons; Dominion Copper Co. smelter, 3,393 tons; total treatment for week, 22,098 tons; total treatment for year, 496,614 tons.

The Risdon Iron Works, of San Francisco, have started up their new 7-ft. dredge on the Baggett ground at Oroville. This dredge is one of their latest designs and shows a number of new features, which will repay investigation. The ground is the hardest known in the Oroville district, and has been avoided by several mining companies on account of this fact. When the pit was being excavated for this dredge, dynamite had to be used, but it was a pleasure to see the dredge start up just like a clock, and it is digging right into the hard ground without any particular effort. Anyone seeing the broken portions of boulders coming up in the buckets, can realize how hard the ground must be, and how strong the dredge that can excavate such material. This dredge has been a long while under construction, namely, six months, owing to its being impossible to get the raw material from the East, but it is a credit to the builders in every way.

Personals.

Richard Pearce is in London.

Thos. H. Leggett is at Chicago.

J. W. Mercer is in San Francisco.

Thos. J. Barbour is in New York.

Robert T. Hill is at Truckee, California.

H. DeC. Richards is at the Engineers' Club, New York.

D'Arcy Weatherbe is at Oroville, studying dredging practice.

O. H. Fairchild, of Denver, is in Nevada on professional business.

Leo Von Rosenberg returned to New York from Arizona on May 23.

Jas. W. Abbott is at Los Angeles, on his return from Rhyolite, Nevada.

A. C. Beatty has returned to New York from a short holiday in Europe.

Arthur Winslow sails from Boston on June 7 for a holiday in Europe.

L. A. Decoto is making a mine examination near Salmon City, Idaho.

A. J. McCone is now at Reno, in charge of the Nevada Engineering Works.

M. B. Holt has returned to Silverton, Colo., from Denver and the East.

William B. Phillips is manager of the Chisos Mining Co., Terlingua, Texas.

Ralph Nichols is now consulting engineer to the Avino Mines of Mexico.

Stanley C. Dunn has been appointed geologist to the Government of the Sudan.

R. M. Simmons is manager of the Texas Almaden Mining Co., Big Bend, Texas.

Clifford G. Dennis is with the Marfa & Mariposa Mining Co., at Terlingua, Texas.

Hudson H. Nicholson has returned from a long trip in Mexico; he is now in Idaho.

Jack Dawson still manages the Terlingua Mining Co.'s mines at Terlingua, Texas.

Alfred N. Newell is managing the Lone Star Mining Co.'s property at Terlingua, Texas.

B. A. Laselle has returned to Barkerville, B. C., from mine examination in Peru and Bolivia.

W. M. Bainbridge, superintendent of El Paso mine, Cripple Creek, is doing jury duty at Denver.

Newton B. Knox is on his way to Japan, where he will have an office, care of Pollak Bros., Yokohama.

G. H. Rotherham has gone to Redding, California, to take charge of a testing plant for the Delta Consolidated Co.

W. W. Allen is leaving New York to take charge of the mines of the Caucasus Copper Co., in Russian Caucasia.

Jas. W. Hill of Pasadena, accompanied by Thos A. Varden of Kennett, Shasta Co., Cal., has been in Nevada City the past week.

G. A. Denny has severed his connection with the General Mining & Finance Corporation. His office is at 603 Consolidated Bldg., Johannesburg.

E. C. Musgrave has resigned as superintendent of the Tyee Copper Company and will practice as consulting mining engineer at Victoria, B. C.

G. D. Doveton, of Doveton & Purington, is at present engaged at Vantrent, California, upon metallurgical examinations on behalf of the American Smelter Securities Company.

Books Received.

Minerals and How They Occur. This is the title of a new book on a subject that is of interest and importance to every student of mining, and to every prospector. It has been written by a distinguished authority, W. G. Miller, Provincial Geologist of Ontario, Canada. It is really a treatise on both mineralogy and geology, as not only are descriptions of the principal minerals and rocks and means for their identification given, but also their occurrence in the field, a feature which will be particularly useful to the beginner. The illustrations, both line drawings and half tones, are excellent, and have been selected with care. Although the territory covered by the work is almost wholly confined to Eastern Canada, the principles are applicable anywhere. This valuable little book will be sent to any address by the Mining and Scientific Press upon receipt of the price, $1. The Copp, Clark Company, Limited, Publishers, Toronto, Canada.

Notes on the Rocks and Minerals of Michigan. This is a handbook intended to accompany the sets of mineral specimens loaned to the high-schools of Michigan by the College of Mines. It is a neatly bound, excellently printed and well illustrated book of 100 pages, 5½ by 8 in. in size. Apart from its immediate purpose, for which it is obviously well designed, the book will be found valuable to anyone interested in the iron and copper deposits of Michigan. In a clear, concise manner it gives an account of the general geology, the mode of occurrence of the ores and the description of the many interesting minerals associated with them. The book was prepared largely by Frederick E. Wright, formerly instructor in the College, but now on the U. S. Geological Survey, Mr. Wright acting under the direction of A. E. Seaman, professor of geology. The price is only 50 cents.

Trade Treatises.

Chalmers & Williams, of Chicago, issue Catalogue No. 1, Section F, which is devoted to concentrating machinery. The pamphlet is particularly well prepared and attractively illustrated.

Smooth-On, an instruction book, fifth edition, has been issued by the Smooth-On Manufacturing Co. of 572 Communipaw Ave., Jersey City, N. J. Smooth-On is a cement for repairing breaks in iron and steel, and this little book explains its use.

The B. F. Sturtevant Co. of Boston, Mass., have issued bulletin No. 48 descriptive of the Sturtevant exhaust head, a device designed to separate the water and oil from exhaust steam by the utilization of centrifugal force. This device cannot fail to be of interest to users of steam power. The Sturtevant Co. have also issued Bulletin No. 75, on mechanical draft, what it is, and what it does. Both bulletins will be sent on application.

Commercial Paragraphs.

The Electric Railway & Manufacturer's Supply Co. has established offices and warehouse at 619 Howard St., San Francisco, and are prepared to supply vulcanized fiber for dredge friction clutches.

The Compressed Air Machinery Co., of San Francisco has erected a new building at Jessie and Ecker streets, and will be able to furnish Giant drills and repair parts, Giant air compressors, Brownell engines, boilers, electric and steam mining hoists and general mining machinery by June 15. Orders for repairs of Giant drills can be filled now. Word Bros'. Drill Maker and Sharpener can be furnished at short notice. Temporary office is at 415 Fillmore St., San Francisco.

The General Electric Co. have their main Pacific Coast office in Union Savings Bank Bdg., Oakland, and a branch at 1759 Geary St., San Francisco. They have leased a half block of land at Emeryville (Oakland) and are now spending about $30,000 for temporary quarters to take care of the large consignments of material. Already 59 carloads have arrived and from 30 to 40 more have left the principal works of the company at Schenectady, New York.

Crocker-Wheeler Co., of Ampere, N. J., recently shipped direct to San Francisco, a carload of their Form L motors ranging in outputs from ¼ to 3 h-p., to be used in the re-building. These motors are now being sold from the company's temporary office, 2611 Broadway, by Mr. H. C. Baker, Crocker-Wheeler manager, in the San Francisco territory. The company is now building at Ampere, N. J., the fourth or last of the 4,000 kw.-alternators ordered by the California Gas & Electric Corporation. Three of these machines, installed in the suburb of San Francisco, successfully weathered the recent disaster.

Latest Market Reports.

Anglo-American Shares.

Cabled from London.

	May 24. £ s d	May 31. £ s d
Camp Bird	1 2 6	1 2 9
El Oro	1 8 9	1 7 6
Esperanza	3 16 3	3 18 1½
Dolores	1 17 6	1 16 3
Oroville Dredging	0 17 0	0 18 1½
Stratton's Independence	0 6 6	0 4 0
Tomboy	1 7 6	1 7 6

(By courtesy of W. P. Bonbright & Co., New York.)

METAL PRICES

By wire from New York.

	Average prices for week ending May 31.	Average for the month of May.
Lake	$18.62@$18.87	$18.72
Electrolytic	18.37@ 18.62	18.46
Casting	18.12@ 18.25	18.28
Lead	5.75	5.68
Spelter	5.96	6.00
Silver	0.67⅞	0.699

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 10 Bacon Block, Oakland, has official reports of the following United States patents issued to Pacific Coast inventors:

820,614.—Metal Saving Machine—J. Balbers, Los Angeles, Cal.
820,754.—Non-Refillable Bottle—G. C. Allen, Port Townsend. Wash.
820,467.—Step Ladder—W. F. Beal, Los Angeles, Cal.
820,129.—Concrete Block Making Machine—M. Rice, Los Angeles, Cal.
820,875.—Wagon Brake—T. N. Johnsen, Wilbur, Wash.
820,133.—Furnace for Smelting Ores—E. Riveroll, Los Angeles, Cal.
820,134.—Smelting Ores—E. Riveroll, Los Angeles, Cal.
820,150.—Fruit Machine—A. M. Striplin, Escondido, Cal.
819,951—Ladder—J. I. Thompson, Elk Grove, Cal.
820,909.—Fence Wire Twister—H. E. Bush, Seattle, Wash.
820,402.—Saw-Swage—O. Dion, Portland, Oregon.
820,855.—Machine for Producing Lath Bolts—H. C. Erickson, Seattle, Wash.
820,635.—Orchard Plow—C. A. Fox, Hanford, Cal.
820,410.—Pulley—H. C. Grannatt, Los Angeles, Cal.
820,497.—Gas Engine—Hurlbut & Munroe, San Francisco, Cal.
820,422.—Cable Clutch—S. A. Johnson, Oroville, Cal.
820,795.—Flushing Attachment—Kleinback & Bareis, Spokane, Wash.
820,816.—Grain Separator—A. McRae, Pendleton, Oregon.
820,817.—Window Frame and Sash—R. F. Nichols, Oakland, Cal.
820,820.—Weed Cutter—H. B. Nolen, Lamar, Wash.
820,731.—Crank—O. S. Phelps, Mapleton, Oregon.
820,734.—Attachment for Agricultural Implements—A. W. Ralph, Ukiah, Cal.
820,523.—Sewing Machine Guide—P. Sandler, Los Angeles, Cal.
820,447.—Rotary Engine—H. E. Thomas, San Francisco, Cal.

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Detailed description of the following works is not deemed necessary. They are standard and the best on their respective subjects.

ASSAYING.

Assayer's Guide.
Lieber; 283 pp. $1.50

Assaying, Aaron's—Part 1—Gold and Silver Ores
Fifth edition; rewritten and improved; 143 pages; illustrated.....$1.00

Assaying, Aaron's—Parts II and III—Gold and Silver Bullion, Lead, Copper, Tin, Mercury.
Third edition; revised and rewritten; new type; new illustrations; new matter.....$1.50

Assaying, Notes on.
290 pp.; Ricketts and Miller....$3.00

Assaying with the Blowpipe, Quantitative.
E. L. Fletcher; 140 pp.....$1.50

Manual of Practical Assaying.
H. Van F. Furman; 463 pp.....$3.00

Manual of Assaying, for Beginners.
W. L. Brown.....$2.50

CHEMISTRY.

Chemistry of Cyanide Solutions.
Clennel; 160 pp.....$2.50

Chemical Arithmetic, Elementary, 1100 Problems.
S. Lupton; 170 pp.....$1.25

Chemical and Metallurgical Handbook.
Cremer and Bicknell; 250 pp....$3.50

Chemist's Pocket Manual.
Meade; 170 pp.....$2.00

Engineering Chemistry.
400 pp. Stillman.....$5.00

Elementary Course in Chemistry.
Ira Remsen; 270 pp.....80c

Elementary Textbook of Chemistry.
Mixter; 440 pp.....$1.50

Inorganic Chemistry.
850 pp. Ira Remsen.....$3.00

Inorganic Chemistry for Beginners.
Roscoe and Lunt; 150 pp.....75c

Laboratory Manual; Principles of Chemistry for Beginners.
G. M. Richardson; 150 pp.....$1.25

Manual of Qualitative Chemical Analysis.
Ladd; 82 pp.....$1.00

Manual of Qualitative Chemical Analysis.
Fresenius; 748 pp.....$5.00

Organic Chemistry.
Richter; 2 vols.....$6.00

Pocket Book for Chemists.
Thomas Bayley; 200 pp.....$2.00

Quantitative Chemical Analysis.
F. A. Cairns; 168 pp.....$2.50

Quantitative Chemical Analysis.
T. E. Thorpe; 160 pp.....$1.50

Qualitative Chemical Analysis.
Clowes; 300 pp.....$4.00

Volumetric Analyses.
F. Sutton; 400 pp.....$5.00

Western Mill and Smelter Methods of Analysis.
Argall $1.50

MINERALOGY.

Catalogue of American Localities of Minerals.
Dana; 52 pp.....$1.00

Handbook of Rocks.
Kemp; 175 pp. $1.50

Lithology; Manual of.
Williams; 308 pp.....$3.00

Mineralogy Simplified.
Erni and Brown; 383 pp.....$3.00

Minerals and How They Occur.
Miller; 252 pp. $1.00

Minerals; How to Study Them.
Dana; 380 pp.....$1.50

Mineralogy.
Brush and Penfield; 312 pp.....$4.00

Mineralogy, Crystallography and Blowpipe Analysis.
Moses and Parsons; 240 pp.....$2.50

Systematic Mineralogy.
Hunt; 390 pp.....$5.00

Textbook of Mineralogy.
Dana; 592 pp.....$4.00

MINING.

Accidents in Mining and Their Prevention
Abel; 700 pp.....$4.00

Argentiferous Lead.
Metallurgy of; Eissler.....$5.00

Blasting, and Use of Explosives.
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EDITORIAL.

WE HAVE RECEIVED many letters of sympathy in regard to the recent disturbance. Two are worth quoting. Says one friend: "May you live long and may you never prospect." But we hope to do both; life is a mortal malady, and those who seek shall find. Another: "I appreciate your loss, but we are glad to know that your square-sets were well lagged up." Yes, there was a bad cave, sure enough, but the levels were kept open and we are pushing forward a new cross-cut that is expected to strike ore on July 7.

THE INTIMATE RELATIONS existing between the Pennsylvania Railroad and the companies that ship coal over its lines have been exposed before the Interstate Commerce Commission at Philadelphia; and the evidence goes far to show why certain independent coal dealers have been harassed by inability to get cars until their business was destroyed. Important officials of the great Pennsylvania Railroad system have accepted blocks of stock in companies that desired to propitiate them. It is high time that such practices were properly labeled. As *The Evening Post*—the most intelligently outspoken paper in America—says: "The officers of the Pennsylvania have subjected their shippers to elaborate and systematic blackmail."

OUR CONTEMPORARY, *The Iron Age* remarks on the lack of linguists in the foreign trade of America. This suggests the similar want in the mining industry. There was a time when French and German were the languages most needed, and as regards general culture they still hold pre-eminence, but to a mining engineer whose mother tongue is English, the second language should be Spanish. The great mining regions of the world today are in countries where either English or Spanish is spoken. We are among those who believe in the continued growth of mining in Spanish America; English and American capital is being diverted in large sums to Mexico, Central America and to Colombia, Peru, Bolivia and Chile. A mining engineer who is ignorant of Spanish will find himself severely handicapped in the extension of his field of activity and many men otherwise well equipped for important positions will lose them for lack of this linguistic accomplishment. The young fellows in the profession should acquire knowledge of Spanish.

EACH WEEK we publish, under the heading of Mining and Metallurgical Patents, a description of the latest devices and ideas applied to mining and metallurgy, and never a week passes but there is something contained in this illustrated page of patents which is of interest and value to the mining community. This time the patents include a new departure in classifiers, patented by Charles W. Merrill. The classifiers previously invented by Mr. Merrill, and used by him at the Homestake plant, are large conical vats, and although they were set on secure foundations, the slightest settling on either side resulted in disturbing the even flow of pulp over the upper periphery of the cone, and prevented proper classification of the sand and slime. To obviate this Mr. Merrill employed various materials in making the rim of these cones, but not meeting with satisfactory results, he tried sheet-lead—and the problem was solved. Any subsidence of the classifier, disturbing the overflow, can be quickly adjusted by carefully planing the soft metallic edge of the overflow rim. This is but one of a number of patents, all of which are interesting to some of our readers.

THE ATLANTIC MINE has finally succumbed to air-blasts. These are due to the violent expulsion of air from workings in which the hanging wall has collapsed. They occur in mines that have a large extent of worked-out ground, which has neither been filled with waste nor securely timbered. When they happen, the vibration is communicated to the surface and a miniature earthquake results. We have described these occurrences more than once, and we refer to the matter again because the mining and financial press tell of "severe earthquakes experienced in the copper region" of "fifty-seven seismic shocks" and of "the great alarm" felt in that part of Michigan. Of course, the people of Houghton and Hancock know the causes of the tremors and do not confuse them with recent occurrences—in Japan, for instance. Anyone who has been in the Atlantic or has seen a longitudinal section of the workings will readily understand why the ground has caved, until the mine has had practically to be abandoned. The lode has been stoped for a width of 15 feet, and over an area 5,000 feet along the strike and 2,500 feet on the dip, with other workings even beyond these limits. The levels are timbered, but the stopes are bare, with a foot-wall sloping at 54 degrees. No wonder the increasing weight of the overhanging rock has gradually crushed the mine and made these juvenile earthquakes. But it is a matter for widespread regret, for the Atlantic has long been a proud example of economic mining in America. With ore containing only 11 pounds, or about half of one per cent, of copper, the Atlantic managed to keep above water and with a yield of less than one per cent, a profit was won. This mine was long associated with the name of John Stanton, who organized the company to work it in 1872 and directed its business affairs up to his death recently. He took a legitimate pride in its cost record and it is a pathetic coincidence that both succumbed so nearly together.

The Trouble at Cananea.

The untrustworthy character of a certain type of newspaper is illustrated by the lurid reports sent broadcast over the country from Cananea. That irresponsible paper, *The Examiner,* came out with positive statements that 45 Americans and 55 Mexicans had been killed and more than twice that number wounded in a fierce battle, that stores had been looted and machinery dynamited. And worse than this, that Mr. Arthur S. Dwight, the manager of the Greene Consolidated Copper Company, together with other members of his staff had been shot down by a multitude of Mexican miners. Local newspapers all over the country copied this rubbish and so caused great anxiety among the friends of those who live at Cananea. And now, as trustworthy news comes slowly, it appears that the brothers Metcalf and seven Mexicans were killed in a small riot, everything is quiet and operations have been resumed as heretofore. The episode did not close without two regrettable incidents, one being the invasion of an armed party of Americans who had been misled by reports and thought it necessary to go to the rescue—incidentally falling foul of Mexican troops. The other was the action of the Western Federation of Miners which in convention assembled, passed a resolution of sympathy with the Mexican rioters under the delusion that they were battling for "industrial freedom." As regards the first, it is well known that the Mexican authorities are quick to repress such disorders and keep a much firmer hand over the unruly spirits in the mining camps than is the case on this side of the Rio Grande; in fact, the rural police is usually most efficient, and even the regular troops are quick to act—except as to the Yaquis. The other se-

quel to the Cananea trouble was foolish indeed, for it was cowardly to express sympathy with a rabble that was reported to be killing our own people in murderous fashion and it was silly to greet them as co-workers for "industrial freedom." No freedom, industrial or otherwise, is won through such means or by such sentiments.

Since the above paragraph went to press, we have received a telegram from Mr. Dwight, who informs us that the trouble is settled and that the excitement has subsided. All departments of the Greene Consolidated Copper Company are in operation at about three-quarters the usual capacity. The only destruction of property to be recorded was the burning of the lumber-yards by the mob, the loss being estimated at $100,000. At one time the entire industrial camp and town were threatened by 2,000 Mexicans on the rampage, but the situation was saved by the prompt action of the American employees who, as auxiliaries of the local police, dispersed the rioters and subsequently aided the authorities in maintaining order, until the next day, when General Ysabel, the Governor of Sonora, arrived. The General came escorted by two hundred Americans from Arizona, who had voluntarily placed themselves under his orders. Regular Mexican troops reached the spot later on the same day, and thereupon the gentlemen from Arizona withdrew, so as to avoid international complications —their withdrawal being as honorable as their arrival had been timely. It is not too much to say that the behavior of the Americans during the crisis was generally marked by self-restraint and good sense. The State and military powers are now in full control and deserve great credit for their attitude during a trying time. No further trouble whatever is anticipated.

All of this is excellent news and most welcome. Cananea is the scene today of one of the most interesting applications of American technical skill, and we trust the professional men who are directing the important mining and metallurgical operations will be enabled to bring them to full and continued fruition without further interruptions of any kind.

Following the Pay-Streak.

In this issue we publish an article which deals with the experiences of a mine superintendent in doing his best to find ore and to follow it. Mr. Nickerson writes as one who has been there and his description will appeal strongly to those who have known the ups and downs of a mine superintendent's life, the eager interest of watching a new cross-cut that is on the point of cutting the vein a hundred feet or more below the last level, the wretched depression of driving a drift for hundreds of feet without finding pay-ore and the keen exhilaration when the miner at the face hands forth a piece of the real thing. And it is not all accident. No man can put ore into ground, but he can use much skill in tracing that which has been deposited there. We are reminded of a day long ago when as manager of a small mine, we were able to announce the finding of a pocket so rich that it cost $200 to extract $20,000 in two weeks. The directors wrote letters of a character needlessly complimentary but when, later, other similar discoveries were not chronicled in the reports from the mine, they wrote complaining of the manager's remissness. They got a reply that, so we afterward heard, astounded them by its frankness, for they were told that the manager had not been consulted at the time the ore was formed in the lode and that therefore he was not responsible for the scant distribution of rich stuff, while holding himself liable for criticism if he did not extract it at a minimum cost when found. But that, as we have said, was long ago—before the days when managers were kept busy making estimates of their ore reserves. Nowadays the instinct or knowledge which enables a miner—call him superintendent or manager, if you like—to find ore and, having found it, to stick to it closer than a brother, is at a discount. People do not value a mine by its probabilities, by the chances of a bonanza or the possibility of a pinch, they send out a lot of clever young men who sample, assay and compute, while another fellow casts his eye over the results and calls it so many tons of such and such stuff. The opinion regarding the chance of finding more ore or the judgment of approaching impoverishment are either avoided by the engineer as dangerous to his reputation or else they are so buried among figures and maps that they are overlooked. We do not undervalue the importance of correct sampling as one of the factors in the appraisal of mines, in fact, good evidence has been given elsewhere as to our conviction to the contrary, but in truth there are many more men nowadays who can take samples accurately than there are those who know how "to follow the pay-streak"; and after all, is it not putting the cart before the horse? If it were not for a few good miners—engineers and superintendents—willing to spend lots of time underground and to watch the changes in drifts and cross-cuts from day to day, with a transit in one hand and a map in the other, we should have precious little ore to sample, whether by good methods or bad. Mining companies that can secure the services of the man who finds ore can usually pay for the help of fellows to sample it in most approved fashion.

The appointment of Mme. Sklodowska Curie to the professorship of physics at the Sorbonne, in succession to her late husband, is an event the romance and pathos of which cause it to appeal to the interest of the scientific world. Mme. Curie is still young and is the first woman to hold a professorship in the celebrated French university. It is said that she and her husband were on the eve of a new achievement at the time of his unhappy death by a street accident. We hope the lady will add fresh laurels to a head already crowned with distinction. From the days of Hypatia and St. Hildegarde, from those of Mary Somerville and Caroline Herschel, women have occasionally been represented among the original investigators, but as a rule they have either been handicapped by husbands that were unsympathetic or obscured by the great men who were the partners of their work. Hypatia suffered for her beauty, so it is said; and in a modern instance a woman of rare mental gifts paid the penalty of her womanhood, for Sonya Kovalevsky gave up marriage to take a chair in the University of Stockholm and, in 1888, received the Prix Bordin from the French Academy of Science, an award made in utter ignorance of the fact that the winner was a woman. Yet at this supreme moment of her career as a scientist, when acclaimed by her intellectual peers and honored by the community in which she lived, she learnt that her lover, the spectator of her triumph, actually in the crowd that gave her an ovation, had withdrawn his suit because unwilling to accept a subordinate position in her interest. This was too much for her woman's heart and she died, a broken creature, two years later. Which brings up the question whether the gain to science outweighs the loss to humanity when a woman becomes a highly specialized intellectual machine.

By the Way.

At a recent meeting of the American Association for the Advancement of Science, an interesting paper was read by Mr. Fullerton L. Waldo on the 'Present Conditions and the Prospect' of the Panama Canal. We quote from it:

The total yardage excavated on the Panama Canal to date is about eighty million cubic yards. The yardage that directly applies along the canal route as finally determined is about forty-one millions. On the 80-ft. level plan, this means that about 28% of the big ditch has been dug; on the 60-ft. level plan, about 23%; on the 30-ft. level plan, about 19%; on the sea-level plan, about 16%. In the roundest kind of round numbers, this leaves about 185,000,000 yd. still to be excavated for a sea-level canal; 140,000,000 for the 30-ft. level; 110,000,000 for the 60-ft. level. The time required, according to John F. Wallace, is twelve, ten and eight years, respectively. The cost would be: sea-level $230,475,725; 30-ft. level, $194,213,406; 60-ft. level, $178,013,406. The yardage cost, 54.7c., is based on the following figures: Installation of plant, 1.5c.; mining, 11.2c.; loading material, 11c.; transportation to dumps, 11.5c.; dumps, 4.5; maintenance of track, 8.4c.; general expense, 6.6c. From May 1, 1904, to May 1, 1905, about 650,000 cu. yd. were excavated. The United States assumed control May 24, 1904, so these figures practically represent what was accomplished during the first year of American occupation.

The enemies of the canal project are legion, and to the friends of the inter-oceanic waterway—which has now become an accepted fact—the description I have just quoted of the conditions that obtain at Panama seems like a jeremiad of the kind the congressional obstructionists delight in. But he who reads between the lines will not find in the generally trustworthy and unbiased account of the engineer referred to any particular reason to be disrouraged about the canal.

Mr. Morison, who saw things in a big, broad way, realized that when once the Americans took over the control of the canal zone, they would, with characteristic American impetuosity, be in altogether too much of a hurry to 'make the dirt fly,' adopting the popular slogan. Morison deprecated haste. He insisted that we must take two years to clean up the mess made by the Spaniards and the French—to burn the hovels, to drain the swamps, to petrolize the breeding-places of the mosquito, to build clean, wholesome houses for the men. He went down there himself and put his fingers into the dry-rot, and found there the seeds of his own mortal illness. Whitewash could not fool him, whether it covered the walls of a pesthouse or whether it concealed some mishandling of canal affairs. A great many men, since Mr. Morison died, have paid tribute to his absolute honesty, and his passion for exact statement based on accurate observation. Had Morison lived, he might have been able to check the tendency to 'hustle,' in the scrambling ambition to make dirt fly simply that the foolable part of our country's population might be deceived by a specious appearance of 'something doing.' All calamity-howlers to the contrary notwithstanding, the canal is as sure to be built as a natural law is certain of fulfilment; and those who today busy themselves trying to find arguments against it are going to be ashamed and sorry when the seas are eventually linked by the greatest engineering undertaking in the history of mankind. For a canal which saves nine thousand miles of ocean journey between San Francisco and New Orleans, six thousand miles between Yokohama and New Orleans, two thousand miles between Hong Kong and New Orleans and six thousand miles between Sydney and New Orleans, is an agency in bringing mankind nearer to mankind too vastly important to evade the sight of God and escape the desire of nations. But just now, rather than any statement of cubic yards excavated in August or September or October, one finds the following figures significant:

In June, 1905, there were 62 cases of yellow fever on the isthmus; in July, 42; in August, 27; in September, 6; in October, 3. In August, 1905, with a force of 12,000 men at work, the death-rate was two-thirds of one per 1,000, whereas under French regime, in August, 1882, with a force of 1,900 men, the death-rate was no less than 112 per 1,000. These figures will appeal to the citizens of a community whose recent fight against yellow fever has been the admiration of the civilized world and a great object-lesson to uncivilized humanity; an object-lesson in civic self-dependence, public spirit and uncommemorated heroism. A city that can pass through such an ordeal, a city that faces a great crisis as New Orleans faced the yellow-fever epidemic, is the surest guarantee that the nation of which that city is a part will do her duty by civilization, and build, expeditiously and economically, the Roosevelt Canal.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

The waters of Lake Tahoe are not available at Virginia City without pumping, the latter being at a slightly higher altitude.

Concrete is often useful about the collar of a mine-shaft and underground as well. Water-tight bulkheads may be made of concrete if properly constructed.

Pure hematite contains 70% iron. Magnetite is higher in iron content—72.4%, but hematite is generally preferred by the manufacturers of pig iron.

At times the cost of hydraulicking at the North Bloomfield gravel mine, in Nevada county, California, was as low as 2.86c per cu. yd., or about 2c. per ton.

Annual assessment work may be done on a patented claim for the benefit of an adjoining unpatented claim, the same as if done on another contiguous unpatented claim.

Mining claims cannot be located within any of the National parks, such as the Yosemite and Yellowstone parks, or any of the military reservations, but claims may be taken within the forest reserves.

Two parts linseed oil, four parts tallow and one part graphite, is said to make an excellent compound for lubricating the teeth of gears. It should be applied hot with a brush when the gears are in motion.

Silver—native, and as chloride and sulphide— is found in fossil fish, wood, and other fossilized objects in Texas, Kansas, Utah, in the Ural mountains of Russia, and elsewhere, and always, so far as observed, in the rocks of Permian age.

Stopes on veins of limited width are usually wider than they are supposed to be, or at any rate, wider than they are reported to be, which may account in many instances for the differences between the estimated recoveries and the actual results in the mill.

Not infrequently an assay of ore shows the presence of both gold and silver, but where the ore is treated in a plate mill, the bullion resulting from amalgamating on the plates will show a higher fineness in gold than is indicated by the assay of the ore, for the reason that ordinarily a higher percentage of gold is saved than of silver.

The amount of assaying necessary to determine the value of a newly discovered vein, depends upon its extent, and the character of the ore. If the vein varies greatly in width, and the ore ranges from a few cents or dollars into the hundreds of dollars per ton it would require a great many more assays than in a case where the vein was of nearly uniform width, with little variation in the character of the ore.

The Scots builder, planning a new hotel within sight of Arthur's Seat, knows from the teaching of geology that it was so many thousand years ago that the rock on which Edinburgh Castle is founded was hurled up from the plain. What he cannot tell is that a like cataclysm shall never shake Scottish fields. The risk is there for all builders on the thin surface; the laws of its variance have not yet been coded.

The law requires that a discovery of mineral be made within the limits of the location claimed, but it is not necessary that the 'discovery' shaft be sunk at the point of initial discovery, as the claim owner may find a better place to do this work than where he first comes upon the vein or ore deposit. This discovery shaft must be on the vein, however, and disclose mineral-bearing rock in place.—Taylor vs. Parenteau, 23 Colo. 368. 48 Pac. 505.

No class of men in new mining regions do more to retard the development of mines than those who stake all the ground they possibly can, regardless of the rights of others. Those who would locate and work on claims, if they could have the opportunity, are unable to buy out these wholesale locators and do not wish to take issue with them at law for obvious reasons, though their case would in most instances be won in the courts. Local rules should limit the number of claims which one person could locate.

A stockholder in a mining company who held no fiduciary or confidential relations or position with the company, that might give him an insight into the private business of the company, may locate the claims owned by the company upon their failure to perform the annual assessment, as required by law, either for himself, or for another, and any one may purchase the claim from such re-locator with perfect safety, but care should first be taken to ascertain that the property was really subject to re-location by the aforesaid stockholders, or any person at the time such re-location was made, and that neither the company nor any other person had performed the annual assessment.

Hot air rises, but when the several shafts of a hot mine are connected by underground workings, as on the Comstock, some of these shafts must necessarily be downcasts. The shaft of the Consolidated California and Virginia mine, known as the C. C. shaft, situated in Virginia City, is a downcast, and the Combination shaft, several thousand feet distant, and sunk vertically in the hanging-wall country, being connected with the Consolidated Virginia workings, at the Sutro tunnel level, is an upcast. The collar of the Combination shaft is higher than that of the Consolidated Virginia. There are numerous other shafts on the lode, which are connected by workings. Some of these are upcast and some are downcast.

Electric as compared with steam heating: Using a good boiler and properly covered supply-pipes, radiators will utilize 60% of the total heat units contained in coal. On the other hand let us, supposing we use an electric heating system, employ a first-class condensing engine developing one horsepower by the burning of two pounds of coal per hour, we shall recover 10% of the heat units in the form of heat energy. Allowing for the friction of the engine, the loss of efficiency in the dynamo and the loss in transmission (line loss), only 50% of this energy is given forth as heat by the electric radiator or 5% of the original heat units. Therefore, but one-twelfth as much heat is recovered by electric heating as by direct steam radiation.

If district mining recorders would personally visit and inspect each claim, the certificate of location of which is offered for record, and see that the claim, as indicated on the ground by stakes or monuments, does not conflict with previously located claims, much unnecessary litigation would be avoided. We never knew of more than one district mining recorder in the United States who did this, and he lived in Madera county, California. He refused to record any claim located in his district without first having made a personal inspection of the corners, and ascertaining that no conflict existed. His charge for such examination and recording was $5 for each claim. He did no surveying, merely visiting the corner monuments of the claim. There were no conflicting titles in his district.

A true metamorphic rock has not been really fluid in the generally accepted sense of that word. At the most the effect of pressure and heat have made it slightly plastic so that it has yielded and slipped a very little. Therefore, when it re-crystallized, the materials did not move far in the rock. If there were in the original sediments successive layers of different nature (such as dark ferruginous mud beneath clean quartz sand) the re-crystallized rock will often preserve the banding; the mud will appear as a dark layer of crystalline ferruginous minerals and the sand bed will be represented by crystalline quartz. Banded structure in metamorphic rocks may also be produced by more active crystallization along slipping planes than in the rest of the rock.—J. E. Spurr.

Occasionally in working a gulch placer deposit the pay, which has become poor, suddenly improves on striking a change in bedrock. When this occurs it may be attributed to one of two causes; either the character of the bedrock forms a better riffle for catching and holding the gold, or the bedrock is itself auriferous, being, in fact, a vein or zone of gold rock. Generally the former would be the safer conclusion, as, if the latter were true, it is probable that the good pay would not begin immediately upon coming to the vein, but gold would be found on the bedrock below it. It is possible however, that the latter may be too smooth to constitute good bedrock and any gold reaching it from the up-stream side would be carried over it, as might easily occur in case of a hard rock, worn smooth by the rushing water and grinding sand.

It is customary, in pan mills, to run amalgamating pans from five to seven times as fast as settlers. Agitators run still more slowly than the settlers. The speed of revolution of each of these devices is a matter for determination by experiment. In the pans the consistency of the pulp and the speed of revolution must be such that the 'quick' is constantly lifted from the bottom and thoroughly mixed with the pulp, avoiding flouring by either excessive grinding or too long continued stirring. In the settler fresh water is added to thin the pulp so that the mercury, with its contained amalgam, may separate from the pulp, settling to the bottom. In the haste of discharge, the pulp often contains finely divided quicksilver, and this the agitator is expected to settle from the greatly thinned pulp. Too rapid revolution of the agitating device will result in defeating the object sought. No arbitrary speed of revolution can be given, it must be suited to the material being treated in each case.

Where a locator lays his claim across the strike of the vein, he may amend the location so as to conform to the true strike of the vein, provided no other locations are made adjacent to his own, but as soon as the surrounding ground is taken by others, he may no longer 'swing' his claim to conflict with these existing rights. His side-lines then become his end-lines, and he has no extra-lateral right. He may work his vein downward within the side-lines until a point is reached vertically below that end-line of the claim which lies in the direction of the dip of the vein. He may, however, still amend his location so as to take 600 ft. on the vein—the distance between the original side-lines, rejecting all but 300 ft. on either side of his vein, thus making a claim 600 ft. square. Should he decide to take advantage of this provision of the law, he may take his extra-lateral right on the 600 ft. section of the vein, but he cannot have both the extra-lateral right and the surface area, 600 by 1500 ft. too, under circumstances such as described. He must relinquish one or the other.

In the operation of crushing rolls care must be taken that open spaces, of greater width than the distance between the rolls themselves, are not allowed to form at the ends of the rolls (between the rolls and the cheek plates), by the improper adjustment of bearings or springs. Cheek plates of hard wood are considered superior to those of metal, by some concentrator men. Also the speed of rolls must be adapted to the material being crushed. The tendency is to speed them up beyond the limit of greatest efficiency, and loss of capacity is caused both by the rebounding of the fragments of ore and by slipping. What is technically known as the 'angle of nip', is important in setting rolls. This angle should be as nearly constant as possible, and this can only be approximated by screening the ore before sending it to the rolls. The angle of nip on lumps of the same size will vary with the diameter of the rolls, and with the distance between them. The efficiency of the rolls depends more largely upon this 'angle of nip' than upon any other one consideration in the operation of crushing rolls.

Petroleum lands may be located under the law applying to placers. For this the United States law provides as follows: "Any person authorized to enter lands under the mining laws of the United States may enter and obtain patent to lands containing petroleum, or other mineral oils, and chiefly valuable therefor, under the provisions of the laws relating to placer mining claims: Provided that lands containing such petroleum, or other mineral oils which have heretofore been filed upon, claimed, or improved as mineral, but not yet patented, may be held and patented under the provisions of this act, the same as if such filing, claim, or improvement were subsequent to the date of passage hereof." The statutes contain no special law relative to discovery on oil-bearing lands, but the courts have recognized the rights of bona fide locators who have taken up land reasonably supposed to be oil-bearing, either by reason of discovery of oil, or of an oil-bearing geological horizon within such lands, or which may reasonably be expected to extend under such land, from neighboring lands previously proved to be oil-bearing, and locators of such lands may remain in possession of their claims so long as they diligently prosecute the work of exploration by means of sinking a well on the land for the purpose of actually discovering the oil-bearing stratum at some point beneath the surface.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

THE TREATMENT OF A GOLD-BEARING ANTIMONY ORE.

The Editor:

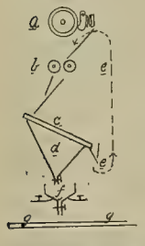
Sir—As a supplement to the very interesting and valuable paper on the 'Separation of Gold in Antimony Ores,' which appeared in your issue of April 28, it may be of interest to describe the way in which were obtained the concentrates on which Mr. Mason did a portion of his work.

This antimony gold ore, as it occurs at the mine, may be divided into two classes:

1. High-grade ore, carrying 40% antimony or over, and separated by hand-sorting.

2. Low-grade ore, being the refuse from the high-grade ore, and that ore in the mine which cannot be sorted by hand to a 40% product. The high-grade ore has been sold to smelters and the low-grade ore left in the mine or on the dumps. About 20 tons of the low-grade material were sent to me for concentration. Various methods of crushing and concentrating were tried, by which it was demonstrated: (1) That the ore must be crushed dry, and that as soon as it is crushed to the required size it must be removed beyond the possibility of further crushing. (2) That the coarsest screen must be used which will allow of a separation of the mineral from the gangue.

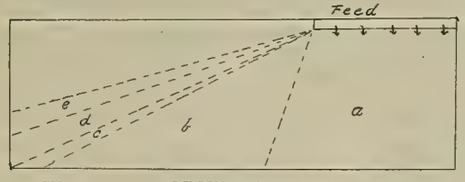
The following was the method finally adopted:



a. Rock breaker.
b. Rolls.
c. Shaking screen, 24-mesh.
d. Bin for undersize.
e. Elevator for oversize.
f. Tank for mixing undersize with water.
g. Wilfley concentrator.

The screen used was twilled battery-screen wire-cloth of 24-mesh and about No. 26 wire. The mill in which these tests were made had been idle for several years and the belting, etc., was continually getting out of order, making it impossible to obtain a steady run. The Wilfley table used was one of the earliest patterns made and difficult to adjust. Any man who has attempted concentration under the above conditions will readily understand the difficulty of obtaining good results.

The separation of the various products on the table was complete, as shown in the following sketch giving as products:



a. Slime.
b. Sand.
c. Middling (returned).
d. Stibnite } Concentrate.
e. Metallic antimony }

The results were as follows:

	Mineral Contents		Weight		Total Gold dollars	Total per cent	Total Antimony pounds	Total per cent
	Gold per ton dollars	Antimony per cent						
Ore	7	6.2	6.5 tons		43.75		775	
Concentrate	24	50.5	1,400 lb.		16.80	38	700	90
Sand	4	1.0	10,655	"	21.31	48	100	12
Slime	18	5.0	444	"	7.99	18	20	2

A number of tests were made on the tailing, that is, sand, from this concentration to determine the practicability of extracting the gold therefrom by means of potassium cyanide or postassium cyanide and bromo-cyanide. The most important of these were as follows:

1. Four assay tons (120 grams) of sand through 24-mesh were agitated in a closed vessel for 24 hours; strength of cyanide solution 0.2%. Extraction equals 30 per cent.

2. Four assay tons (120 grams) of sand ground through 100-mesh were agitated in a closed vessel for 24 hours; cyanide 0.2%. Extraction equals 50 per ecnt.

3. Eight assay tons (240 grams) of sand ground through 100-mesh were agitated in a 0.2% solution of potassium cyanide and 0.1% bromo-cyanide for 36 hours. The solution was tested at the end of 24 hours and made up to initial strength in cyanide and bromo-cyanide. Extraction (based on assays) equals 80%. Extraction (based on gold precipitated and recovered) equals 75 per cent.

Further work on a large scale using bromo-cyanide on other ores has convinced the writer that there would be no difficulty in carrying out commercially the results of the above test No. 3. The treatment of the low-grade ore would therefore seem to resolve itself into a system of dry crushing and concentration, obtaining: (1) Concentrate, treated by some such method as Mr. Mason suggests; (2) Sand, treated, after regrinding, by bromo-cyanide; (3) Slime, which contains no metallic antimony, could be leached with caustic soda as Mr. McArthur proposes and the residue, thus freed from antimony, added to the sand No. 2 and cyanided.

E. PERCY BROWN.

Halifax, May 26, 1906.

EARTHQUAKE SOUNDS.

The Editor:

Sir—Referring to your editorial in the issue of the 24th ult., on 'Earthquake Sounds,' I am reminded of what I heard and saw of the earthquake in California in 1872.

At that time I was engaged in making my surveys for the large scheme of irrigation for the San Joaquin valley. I was camped on the west bank of the San Joaquin river between Bantas and Stockton, and south of the Central Pacific Railroad. I was asleep in my tent and awakened by a rushing sound, like a heavy freight-train traveling at a great speed. A minute or two later (so it seemed) came a great shaking of the ground which made me jump out of bed and go to the door of the tent. I then saw the water in the river thrown from bank to bank and some of it was thrown into my tent, which was about 25 ft. from the bank. Subsequently (if I remember rightly), long lines of cracks or crevices were found on the Mono side of the Sierras.

I can remember another occurrence of this earthquake sound preceding the tremblor, when I was in India in 1866 constructing the railroad between Bombay and Calcutta. This occurred in the Nerbudda valley; then there was quite a pause between the sound and the shake-up which made me feel sea-sick.

R. M. BRERETON.

Woodstock, Oregon, June 4, 1906.

THE MINING BOSS OR FOREMAN.

The Editor:

Sir—The discussion in your recent issues of the article of Mr. R. B. Nickerson on 'Handling Men Underground' serves to give merited prominence to the importance of the position of mining boss, or foreman; I trust it may awaken a rational consideration of a subject, the true import of which seems to be overlooked, or misunderstood, by many managers of mining properties.

I can conceive of no mining position, excepting that of manager, which is of so much significance in the operation of a mine, as that of underground boss, or foreman—a fact that is patent to every observing person of experience in the management of mines. Upon the foreman devolve many duties, the efficient discharge of which requires abilities and qualities of no ordinary character. An enumeration of some of the things he ought to know how to do and a few of the qualities he ought to possess, will establish, I believe, the correctness of my opinion as to the value and importance of his position.

He should have had practical experience to enable him to perform all kinds of underground mining in a speedy, economical and scientific manner. He should have useful knowledge of the various kinds of machinery for hoisting and pumping purposes and for operating power-drills; he should be skillful in timbering, an art of the utmost importance for both the safety of life and the physical preservation of the mine; he should have at least a fair knowledge of the minerals of commercial value found in the mine, and also of the rocks in which they occur, and of the formation inclosing them; he should be quick to detect all changes in the orebodies and the formation, and to note the results of the same, that such data may serve to guide him or the manager in determining, in accordance with recognized and accepted geological principles, the best course to pursue, because of such alterations; he should be adept in the use of all necessary tools and explosives; he should have an intuitive judgment in fixing gradients, so as to secure an easy and rapid transit of cars and to conduct the flow of water, if any, to a common receptacle; he should appreciate the value of thorough ventilation and be capable of installing the means to procure it; he ought to know the amount of work to be fairly expected from every man under him, and, he should be so considerate as to place and combine men in such a way that but little or no disproportion of labor will ensue, thus precluding apparently valid reasons for charges of purposed severity, or favoritism; he should be neither ill-humored nor patronizing, but he should try to evince and maintain a disposition regardful of the rights of the men, and yet preventive of that familiarity which destroys discipline and produces neglect; in fact, he should be able to do anything and everything underground, and should have an ambition to produce the best obtainable results without harsh methods, or without endangering the lives of the workmen, or hazarding the physical preservation of the property; and, finally, he should manifest fidelity to his manager in everything pertaining to his position, which does not involve the infraction of manly independence or of moral principle.

Such a man is of great value to the owners of a mining property, and he should receive a salary commensurate with his qualifications and the responsibility of his trust. Success or failure often depends on the foreman. It is a great mistake to suppose because a man is smart, clever, or even well educated that he can make a competent foreman and run a mine without considerable practical experience. Hence, the selection of this officer will be made with great care by any superintendent, or manager, who knows his business, and is desirous to achieve marked success. In truth, the selection and retention of a capable foreman is no slight evidence of the ability of the manager or superintendent. I hope it is opportune to observe that the qualifications to constitute an efficient foreman are to be acquired step by step, in one school only, that of ocular and manual experience.

JEREMIAH MAHONEY.

Denver, May 31, 1906.

Nickel is derived mainly from two important classes of ore: 1—Garnierite, a hydrous silicate of nickel and magnesia, of the composition $H_2(NiMg)\ SiO_4+Aq$, discovered in 1867 by J. Garnier in New Caledonia. The output of this ore had increased in 1902 to over 120,000 tons. Lately the production has fallen off owing to the exploitation of the Canadian mines. The ore tests as much as 30 to 40% nickel, but the average grade shipped is 7%; occasionally consignments as low as 5% have been exported. Moisture varies according to circumstances between 18% and 30%. 2.—Nickeliferous pyrrhotite and chalcopyrite. With the exception of a formerly somewhat important mining operation in Norway and Sweden, practically all the ore comes from the nickel and copper district of Sudbury, Ontario. The average amount of nickel is 3%, and that of copper under 2%. The Scandinavian supply above mentioned never amounted to much, and since 1891, when 125 tons of nickel were produced, it has dwindled into insignificance. Regarding the cost of manufacture of nickel from the 7% garnierite, the following figures, from private sources, are fairly correct, per ton of marketable metal: Smelting and bessemerizing, £45; grinding and calcining, £5; reducing, £5; total, £55. This does not include cost of ore, freight to Europe and standing charges of works, which amount to another £60 to £80 per ton, making a total of £120 to £130 per ton of metal.

The Cullinan Diamond was found in the Premier mine, near Pretoria, by Mr. Wells, surface-manager, in the yellow ground about 18 ft. from the surface, on January 25, 1905. The weight of the stone is 3,024¾ carats, or about 1.7 lb. troy, and the dimensions are about 4 in. by 2½ in. by 1¼ in.

The big diamond is a portion of a much larger stone, the original form of which can only be roughly guessed at. Four pieces of this original stone have been broken off along cleavage-planes, which we know to have the position of octahedral planes. Each of these fragments must have been of considerable size. Consequently, the stone itself shows only a portion of its original natural surface (called 'nyf' in the diamond-cutters' jargon), the greater portion being formed by these four flat cleavage-planes. The remaining part of the surface shows one octahedral face and a curved irregular surface roughly corresponding to six faces of the dodecahedron, while one very irregular face of the hexahedron is indicated by quadrilateral impressions which are characteristic of these faces in minerals, such as the diamond, which possess the octahedral mode of growth. The stone is a single crystal, no twinning-planes or twinning-lamellae being present. It is quite colorless, its perfect transparency being best compared to that of pure ice or of the variety of silica known as hyalite. There are a few grains (inclusions), and also some flaws, or internal cleavage-planes—'glessen,' as the diamond-cutters call them—in it, but their position is such that they do not detract from the value of the stone as a gem. It is certainly the purest of all the very big stones known.—G. A. F. Molengraaff.

Mining Soft Iron Ore Without Timber.

Written for the MINING AND SCIENTIFIC PRESS by STUART RHETT ELLIOTT.

On the Marquette range, the term 'soft ore' is used in a general way to include all iron ore that does not possess the well-marked characteristics of the hard crystalline ore of that region. The method of mining to be described is applicable to a variety of ore that drills easily, breaks and runs freely, and yet is hard enough to stand for a considerable time over a large opening.

The method is now being practiced at the Hartford mine, on the Marquette range, at Negaunee, Michigan, by Capt. James Piper. It is not, however, my object to explain the conditions at this or any particular mine, but merely the general principle involved. I am indebted to Capt. Piper and to Mr. André Formis, mining engineer for the Oliver Iron Mining Company, for many details.

Assume a soft orebody that is 75 ft. thick, that strikes east and west, and dips south at an angle of 45°. The foot-wall is a slate; the hanging is an exceedingly tough and compact jasper. The shaft is sunk in the foot-wall and the levels are turned off from the shaft at appropriate intervals. On each level a drift is driven in the foot-wall quite near to the ore and parallel to it. These drifts are shown in Fig. 1. From each drift, at intervals which depend upon the conditions of the mine, cross-cuts are run out as in Fig. 1 and driven through the ore to the hanging wall. These serve to open up the ore. One further preliminary step is necessary. Along the space of about 15 ft. just before the cross-cut passes from the foot-wall into the ore, that is, before it crosses the margin of ore on the foot-wall side, the cross-cut is enlarged into a room by cutting out the rock as shown in Fig. 2. This room is timbered and is made about two sets high and three sets long. The object of this is to afford space for the handling of the ore through chutes and the loading of cars. The timber in the lower sets near the foot should be large and strongly braced in all directions, not only to support a great weight but also to resist the shock due to the rolling down of large masses of ore.

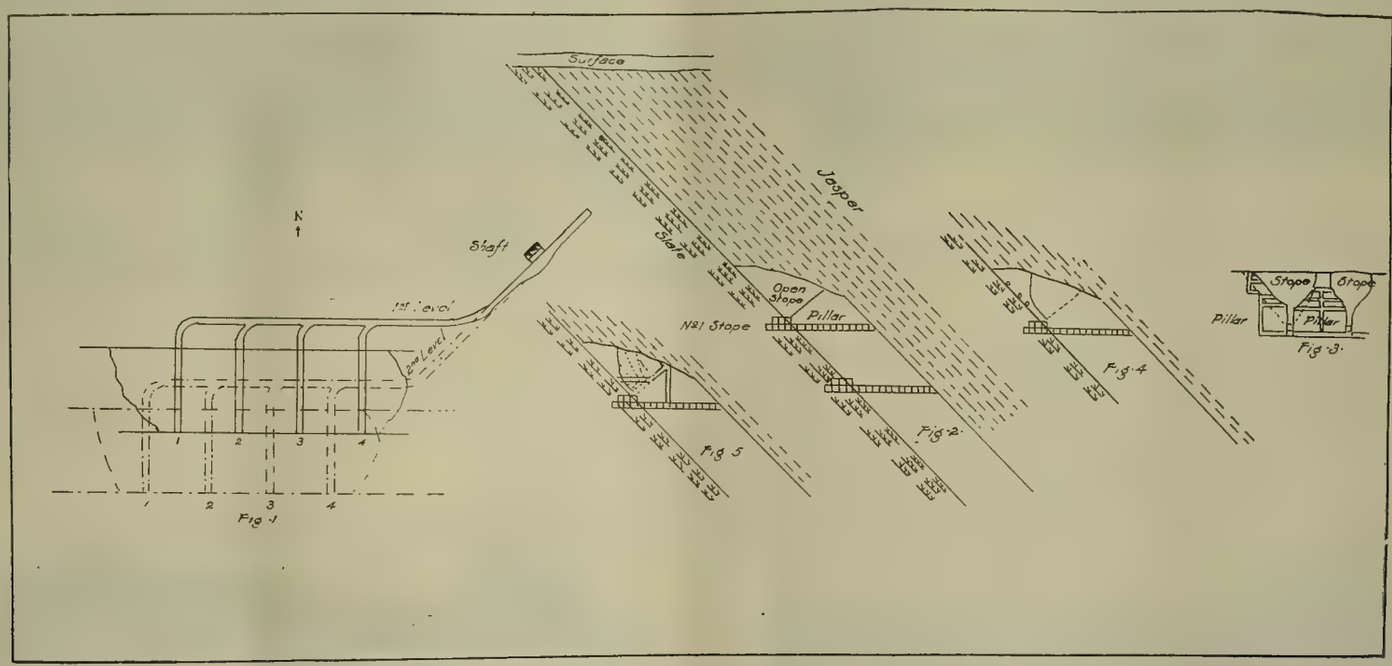
Now then; from the top of each of these rooms, a raise is started and carried up on the foot for a height of about 20 ft., its dimensions being eight feet square. From this point it is widened out in all directions so as to assume a funnel shape, as shown in Fig. 3 and 4. Long holes are drilled into the brow toward the hanging and blasted—increasing the width of the stope as it goes up. As the stope increases in height, the greater will be the area of unsupported back, and the greater will be the burden on the holes; consequently a large amount of ore will be broken with a few long holes as the stope becomes advanced. The ore is broken down in this fashion until the next level above is reached. Fig. 4 shows a cross-section of the stope. The dotted line in this figure shows the stope completed.

In order to afford ready access and egress, to and from the working places in the stopes, while this work is being carried on, a number of sub-drifts and raises are provided. A small drift is driven along the foot from the room in the cross-cut for about 30 ft., when a small raise is put on the foot for about 40 ft. From this raise a sub-drift is turned off at such an elevation that, when driven back along the foot, it will hole into the stope directly under the back of ore. See Fig. 3. A similar drift is maintained on the other side of the stope. As the stope increases in height, new drifts are turned off higher up from the raises. In this fashion drifts are always kept open immediately under the back of ore. With a drift on each side of the stope, a safe exit can always be provided and with a drift always opening into the stope close under the back, the men need never take the risk of going out into the open where the back is high, but can walk along the upper edge of the stope where the back is never more than a foot or two above their heads and a solid wall on one side.

After all the ore has been taken out that is possible by stoping from the foot, the shape of the stope resembles that of a funnel. It is now desirable to get out more ore toward the hanging. In order to do this, the miners start in from one of the lower drifts and work around in a sort of semicircle on the slope of the funnel. They start by cutting back toward the hanging, making a groove until they reach the foot-wall again on the other side of the stope. In this way they under-cut considerable ore, all of which they blast down except a small ledge left over their heads, to protect them while making another semicircular cut. As soon as this process has reached such a point that the slope is too gentle to cause the ore to run down to the chute, an under-cut is started a little higher up and carried around as before in a semicircle. Fig. 5 shows the removing of this pillar of ore. The dotted lines give the outline of the stope at different stages of the operation. An extra cross-cut is also shown. This work can be carried on until the hanging is reached, if there is no danger of the latter slabbing off, otherwise a small pillar will have to be left to protect the men. When the under-cutting and raising has been continued in a semicircle up to the hanging, all the ore below the rock or capping will naturally fall, as there is nothing to support it.

The same process of working is used in each stope in the mine. Care, however, must be taken to leave a pillar between adjacent stopes. If two adjacent stopes should hole into each other the men would be left without protection above them. The main cross-cuts on the second level should be driven so as to come under the pillars on the first level. The pillars between stopes on the first level can be under-cut and blasted, or they can be brought down by undermining in the stopes from the second level.

There still remains a pillar on the foot, a part of which will be difficult to get. It can be under-cut to a certain extent on the foot and blasted, the ore finally running down to the second level. Raises can also be put up through the foot from the main drift and a part of the ore run to the level. The men who load the cars are protected by the foot-wall and are in no danger. The ore runs down into the sets above the main drift, where it is scraped through holes in the lagging into the car below. The lagging must be particularly strong. Steel rails are sometimes used in addition to ordinary lagging.



MINING SOFT IRON ORE WITHOUT TIMBER.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock samples from Bisbee, Ariz., marked W. V. S., are determined as follows: No. 1, Hornblende-andesite; No. 2, Syenite-porphyry; No. 3, Syenite; No. 4, Rhyolite; No. 5, Andesite; No. 6, Syenite; No. 7, (Drill Core) Diorite; No. 8, Andesite-tuff.

The interesting rock specimens from Tolo, Oregon, have been determined as follows: No. 1, Quartz-diorite, in which plagioclase feldspar predominates. The other important constituents present are hornblende and quartz. A little biotite is also present. No. 2 is the same rock but also shows some orthoclase, which would place the rock in the Grano-diorites. This differential occurrence of minerals in rocks of this description is frequent; No. 3 is more basic, containing relatively little quartz, and more hornblende. Copper sulphide, (chalcopyrite) occurs in small disseminated crystals.—As it occurs in the mass of No. 1-2, it is a segregation of minerals from the main mass; No. 4 is Diabase; No. 5, Steatite; No. 6, Marble, (crystalline limestone); No. 7, bluish Marble, otherwise similar to No. 6; No. 8, also Marble, but of finer grain. It is not probable that either 6, 7 or 8 would make good structural material, owing to the decided schistose structure developed in them. They would make good lime, however; No. 9, Diorite, much altered by weathering. The brownish spots are due to the removal of some iron-bearing constituent now indeterminable; No. 10, silicified wood; No. 11, Jasperoid. Rock of this character is not infrequently found in the vicinity of bodies of copper ore; No. 12, Pectolite; No. 13, an aggregate of scales of Sericite, (hydrous mica); No. 14 is largely composed of calcium carbonate and iron oxide. A small amount of cinnabar is seen following a seam of calcite; No. 15 is Serpentine showing numerous scales of the rhombic pyroxene, bronzite; No. 16 is finely granular silica, probably the result of the alteration of some other rock; No. 17 is Calcareous Graywhacke; No. 18 is a coarse Grit or sandstone, composed of little rounded pebbles of dark-gray flint, compactly cemented by argillaceous and limy material; No. 19 is a piece of Bituminous Shale; No. 20 is Diorite. The feldspars are mostly bright and fresh, but the hornblende is almost wholly altered to scales of chlorite. Quartz and orthoclase occur, but sparingly; No. 21 is Diabase-porphyrite; No. 22, Aplite (fine-grained micaless granite); No. 23, fragments of various rocks cemented by calcium carbonate; No. 24, ferruginous limestone; No. 25, a silicious Breccia, one side of which is altered and penetrated with iron oxide; No. 26 is a portion of a Pegmatite (coarse granite) dike. It carries a little pyrite, and may contain gold; No. 27 is Limonite. This is seemingly from the gossan of an iron-bearing lode. In one place appears a peculiar iridescence, which is often an accompaniment of gossan covering a deposit of sulphides carrying copper. No copper ore, of any kind, is visible in the specimen, however.

Manhattan.

Written for the MINING AND SCIENTIFIC PRESS by
A. H. HALLORAN.

The skilful ways of New York financiers have apparently been transmitted to the Manhattan pioneer. Refined Eastern methods have been metamorphosed in changing the scene of operations, but the result is the same,—an attempt to precipitate money from the pockets of the unwary. Yet both the stock in New York and the mine in Nevada have an inherent value that warrants careful investigation. For there is gold in Manhattan. Apparently scattered in lavish profusion over a wide area, its presence will brighten the streak in the panning of almost any part of the district. The prospector has proved its existence; it remains for capital to determine the quantity of it. To attract money, many questionable methods have been tried. It is toward some of these that my prefatory criticism is directed.

A REST-HOUSE IN THE DESERT

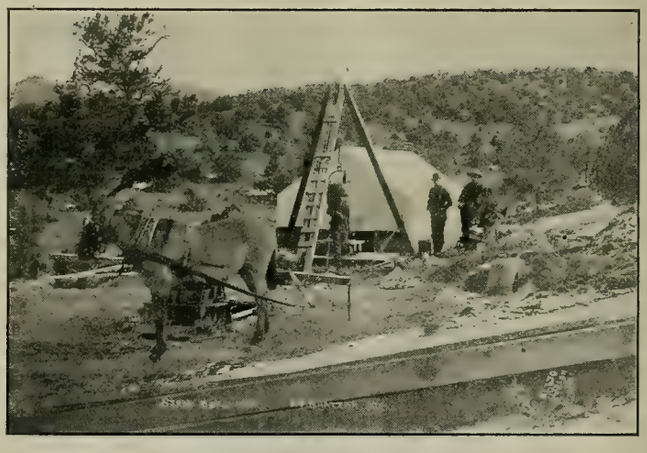
THE TOWN OF MANHATTAN.

The Manhattan mining district is 45 miles due north of Tonopah in Nye county, Nevada. It is a small area, about two miles wide by seven long, following the course of Manhattan canyon in the Toquima or Smoky range of mountains, separating Big Smoky valley from the Ralston desert. The elevation of 7500 ft. gives a cooler, moister climate than is found further south, and also some timber. The steep sheltered sides of tributary canyons support a sparse growth of pinon and juniper with some fir and mountain mahogany. This will give fuel, but it is too scrubby for mining purposes. Water has been found in wells from 50 to 100 ft. deep. It is sufficient for domestic use, but not for milling. During the current month it was delivered in most parts of the town for $1.50 per barrel. Apparently much of the water is from the melting snow which rests upon the higher points until late in the season. With the accompanying verdure it forms a pleasing contrast to the somber coloring of the desert. The Toquima range is typical of the abrupt chains corrugating what would otherwise be a monotonous expanse of desolate plain.

The general north and south parallelism of these uplifts together with the aridity of the region, have deterred the most adventurous prospector from going far from a base of supplies. Yet old abandoned workings often surprise us today as testifying to activity in the 60's and the 70's. Silver was discovered at Belmont, 12 miles to the east, in 1865. A 40-stamp mill costing $225,000 and a 10-furnace roasting plant were treating a part of this ore in 1868. The Manhattan of today is re-named from an abandoned camp on the other side of the range. Such revival is characteristic of what is taking place all through a forgotten Nevada. Its permanence is assured by the conveniences now at the miner's disposal, in contrast with the hardships undergone by his predecessors. With slow-moving ox-teams they painfully crawled over a country marked only by the bleaching bones of the few that had preceded them. An automobile now speeds over the same trail, marked by 'dead soldiers' thrown out by the thousands who have joined in the 'rush'. Freight is sometimes hauled from Austin, 90 miles to the north, but passengers usually come in by stage or automobile from Tonopah. This trip of 45 miles is made in three hours at a cost of $20 per person. The stage makes the trip in seven hours and charges $8.

Gold was discovered here in April, 1905, but it was not until January of this year that the stockbroker and real estate boomer realized its attractiveness to the capital that had been denied admittance on the ground floor of other Nevada excitements. Last December the cabins of less than a hundred prospectors marked the site of the bustling camp of today, boasting a population of three thousand men. They have come mostly from Goldfield and Tonopah, and are fully experienced in the art of booming mines. Thus it is that already Manhattan is the best advertised camp in America.

STAGE-COACH PASSING AN ORE-WAGON.



THE YOUTH OF A MINE.

So far but little actual mining has been done. Claims have been located, other claims have been re-located over them, and still other claims staked on the snow covering pre-existing claims, all blanketed with claims newly recorded since the snow has melted. Yet to many companies merely mining on paper this is as satisfactory as though they actually did own a few square feet of ground. It offers a pleasing prospect to an ambitious lawyer.

Adverse weather conditions and a wild scramble for locations have prevented geologists from making a detailed study of the district. While in the camp I had an opportunity to go over most of the ground and through the best developed claims. The oldest rock is evidently a granite; deposited apparently upon this, is a great series of altered sediments, including schist, quartzite, shale and limestone. Covering these are great extrusive masses of rhyolite and other igneous rocks. The sediments and later extrusives are crossed and recrossed by a network of zones of silicification, some of them auriferous. Gold may be found in any or all of these rocks. To the south of the line followed by Manhattan canyon the bedding dips at an angle of 45° south; to the north of the same line a comparable sedimentary series dips at a similar angle to the north, except in places where the dip has been reversed by the rhyolite. A prominent limestone bed can be traced in an almost perfect ellipse around the camp. Its continuity is interrupted in places by the rhyolite flow.

Such evidence warrants one in reconstructing the district as an anticline or 'turtle back' fold, the eroded axis of which is now approximately followed by Manhattan canyon. A cursory survey shows this to be but one of a great billowy series of similar uplifts extending for miles along the range. In many places they have been obliterated or displaced by the great flows of rhyolite. Both before and since this igneous extrusion the physiography has been carved during long periods of erosion so as to lose all semblance of its original form. The sedimentaries have been determined as pre-Cambrian, the rhyolite as Tertiary. The uplift and subsequent erosion occupied the interval between these periods. Mineralization has been the most recent of all events in this history. Both the rhyolite and the sedimentaries are freely mineralized along zones of fracture.

There is not yet sufficient evidence to justify the statement that the great areas of granite to the south have been the cause of the uplifting and metamorphism of the sedimentaries, for this may have been effected by subsequent intrusions of certain silicious fine-grained dikes carrying but few bi-silicates. The deeply eroded surface of the upturned shales shows that the anticline was formed long before the great outpourings of lava. This lava consists chiefly of rhyolite and tuff.

The stratified rocks are limestone, shale and quartzite; they have a thickness of at least 6000 ft. The limestone is mostly a compact dark-blue rock, usually fine grained. It contains many small seams of white crystalline calcite. Often it has been largely replaced by silica. A yellowish dolomitic limestone was observed as a narrow bed in the shales and schists to the south. The shale has been much metamorphosed and presents

every phase from soft shaly limestone to hard contorted schist. The quartzite is but an indication of the great silicification to which the district has been subjected; when jasperoid, it is seldom metalliferous.

The rich ore follows closely the line of a silicified limestone bed near its contact with a red schist. These bedding veins course approximately east and west, with numerous north and south connecting cross-fissures. The wonderfully rich gold specimens have usually been found at the intersections of these vein-systems. The workable ore is a silicified lime containing cavities filled with calcite and fluorite crystals, the gold showing beautiful crystalline forms on these. The ore is spotted and 'pockety' in character. In some cases the lime has been

SACKING ORE AT MANHATTAN.

crystallized to marble and forms the foot-wall. Evidently there have been two periods of mineralization, first, one in which great silicification took place with little gold deposited except in pyrite crystals, and later a deposition of gold, fluorite and calcspar from ascending vapors or solutions, the latter forming the high-grade deposits. Some of the bedded veins are 30 ft. wide and offer good milling propositions. The high-grade ore is found in narrow veins.

But little development wo.k has been done, and that mostly by lessees. On the Union No. 9 a shaft down 160 ft. has opened up some high-grade ore. A cross-cut tunnel and shallow shafts on the April Fool—the discovery claim—have disclosed high-grade ore. The Manhattan Consolidated G. M. Co. has opened up a fine body of milling ore in the Silver Pick. It may be a coincidence, or otherwise, but the best showings follow the ellipse roughly outlined by the Portland, Annie Laurie, May Flower, Big Pine and Reilly Fraction, Jumping Jack and Stray Dog, Union No. 9, Little Grey, Mustang, Chipmonk, April Fool, Litigation hill claims, Silver Pick and Pine Net. Sulphide ores have been opened up on the Iron King and Iron Queen. These properties also contain the yellow dolomitic limestone previously mentioned.

From some of these and other properties some high-grade ore has been sacked, forming an imposing barricade around the whim or windlass. Much of it is in the same place it was three months ago. Very little has been shipped, because the pictures of the sacked ore are possibly more impressive than the smelter returns. Unfortunately a great many 'wild-cat' companies have been formed, their only mining being confined to working possible investors. Nevertheless, there are a few good companies engaged in legitimate mining. One purposes sinking a prospecting shaft to a depth of 1000 ft. to test the continuity of the ore. Others are erecting hoists and will start development work. Until this has been done Manhattan mining will remain a precarious gamble.

Gypsum occurring in metal-bearing veins is a result of decomposition of some calcium-bearing mineral, possibly calcite, or the lime in some felspathic rock present in the vein or in the walls, and which has been acted upon by sulphuric acid derived from decomposition of sulphide minerals. Gypsum has been known to occur in gold, silver and copper-bearing veins, but it has no important significance.

A New Method for the Purification and Softening of Water.

At the present time, in all the large industries, there is a growing demand for pure water. The time when any kind of water was considered good enough to feed into boilers has gone by, and experience has shown that even a comparatively large expenditure is justified if, by such an outlay, a water may be obtained which will not leave a deposit of scale in the boiler. To this end, various boiler compounds have been invented which, by their action, produce a flocculent precipitate, instead of a hard scale when evaporated in the boiler. This flocculent precipitate may be blown out through the mud-drum and leaves no ill effects, as it will not clog the tubes. The present methods of obtaining such a precipitate, however, are not of the best, as they necessitate the introduction into the boiler of various chemical compounds which in themselves add greatly to the volume of foreign matter which it is desired to get rid of, and often strongly corrode the boiler-plates and tubes.

There is another kind of water which, while not leaving a scaly deposit, is just as bad in its effects, if not worse, as it tends to destroy the boiler-tubes completely, instead of filling them up with scale. This is water of a slightly acid reaction. It will be seen, therefore, that a process that will eliminate the greater part of the salts held in solution and at the same time give the water a slightly alkaline reaction, accomplishing this result without the addition of chemicals, would be a great boon to most of the industrial enterprises of this day. Such a system has just been invented and it is the purpose of this article to describe it in detail.

The process is an electrolytic one and unites in a single apparatus all the advantages of efficient filteration and cheap electrolysis. Although there are other processes which accomplish good results, they are not altogether electrolytic in their action and consume so much current that they are prohibitive for adoption on a large scale. This new system will purify and soften water at a cost not exceeding 1½ cents per 1,000 gal., computed for the most obstinate of waters and on the prevailing charges of the New York Edison Company for electricity.

The electrolytic action causes the precipitation of the principal scale-making compounds, found almost everywhere in water, consisting of: Sulphate of lime (gypsum), carbonate of lime, carbonate of magnesia, phosphate of lime, iron oxide and silica. The passing of the hard water through the apparatus causes the precipitation of most of the mineral substances above described, the acidity is destroyed and the iron deposited at the cathode.

The new process, instead of driving free oxygen from the water, liberates an excess of this important element, which, owing to the shape of the positive electrode, is kept in contact with the water and eventually is re-dissolved. This has the effect of strongly vitalizing the water and at the same time sterilizing it, owing to the bubbling through it of ozonized oxygen generated at the anodes, it being a well known fact that nascent oxygen is one of the most active of germicides. Another important factor which tends to rid the water of bacteria and make it suitable for drinking, is the precipitation of solid matter; this tends to carry down with it other substances held in solution and effectually clears the water of organic matter.

The apparatus consists of a cylindrical iron tank divided into two parts by a vertical partition. The anodes are baffle-shaped plates of iron, the cathode being the wall of the tank itself. By this arrangement the hydrogen, liberated at the cathode, has free access for escape, while the oxygen, liberated at the anode, is held in confinement until enough has accumulated to overflow into the surrounding water. The solid matter is precipitated to the bottom of the tank while the treated water overflows to the filter contained in the other half of the tank, thus making a very simple and easily transported outfit. This process is controlled by the Electric Water Purifying & Filter Company of New York City.

A PROSPECTING SHAFT.

All rocks, even sandstones, do not break equally well. Gillette says a cut six feet wide was made in sandstone with drill-holes spaced three feet apart, thus requiring 4½ ft. of hole per cubic yard of rock. In seamy rock, shallow holes four to six feet deep were drilled, and from two to three sticks of 50% dynamite charged in each hole. The cartridges were one and one-half inch diameter and eight inches long. In solid rock, the holes were drilled eight to ten feet deep and double the amount of dynamite used.

Following the Pay Streak.

Written for the MINING AND SCIENTIFIC PRESS by R. B. NICKERSON.

There are veins that seem to have been made to serve as illustrations for those who teach mining by books. They present ideal conditions. The veins are of a good size to work, say five or six feet and pitch at an angle of 50 or 60°. The walls are hard and firm and the vein pursues the even tenor of its way in a stately and dignified fashion in length, breadth and depth. Very little water is encountered in the development work, but there is an abundance at hand for power, with timber, etc. in the immediate vicinity. To complete this pen picture we will say that the ore is free-milling and goes $25 per ton. This is the kind of a mine that the honest miner had in his mind's eye when he remarked "Damn a mine that won't pay under any kind of management." Coming down to stern realities, it may be remarked that mines answering this description resemble the visits of angels in that they are few and far between. They are the good things, which like the buffalo seem to have long since disappeared from the face of the earth. They are the kind of mines that cause the fortunate investor to regard mining as a good thing and to assure his friends that "legitimate mining is no gamble, but an industrial proposition."

But how different from the foregoing description are the real conditions that usually confront the miner! All kinds of difficulties must be faced. The veins are uneven and irregular, often consisting of a system of streaks difficult to understand or follow. Separated by horses, displaced by dikes and faults, many feet apart, it is no wonder that orebodies are missed, overlooked, or lost. Wet, heavy ground is encountered requiring large pumping plants, and a forest of timber is used to hold the ground up. The cream of the mines, the rich surface ore, further enriched by erosion and oxidation, is all gone. The miner must sink deep shafts or run long tunnels in order to open up bodies of lower grade ore—often so low-grade that, after equipment and months of development, the expense when subtracted from yield, leaves but a small margin of profit and that profit possible only when the closest and most rigid economy has been observed. The patient and long-suffering stockholder feels that mining is not all his fervid imagination had painted. Let us suppose that a mine has been worked for years at a profit, and while it may still be paying, the management deem it advisable to sink a new shaft or drive a new adit to tap the vein deeper than the present workings, in hopes of finding orebodies below. The work is done and the miner finds himself hundreds of feet below the old workings and in virgin ground. If a perpendicular shaft has been sunk, he starts his cross-cut to intersect the vein formation. The crucial moment has arrived. The development work has not been done without a great deal of deliberation and planning, in which expert opinion has been called in from the outside and paid for. The work has cost thousands of dollars. Obstinate and conservative members of the board of directors have been argued with and brought over to the new plan; and now the time has arrived when any stroke of the pick may uncover the much-coveted prize—a good orebody. The life of the mine depends upon what the development work will discover. To the superintendent who has faith in the mine and has recommended the work, it is a trying time. There is no rest for him now. The vein is struck with a rush of water; so far so good. The fissure is open, but what a disappointment! The gouge is there, but without ore; the formation is dull and dry looking. The quartz is glassy and brittle with no life in it; it contains some sulphides, but they are not the right kind. It is evident that there is no orebody here; it must be found elsewhere.

One way to prospect a mine in the condition just pictured, is to cross-cut the vein formation and drift on the foot-wall, making cross-cuts at intervals of every 50 or 100 ft. so as to test the formation up to the hanging wall and a little beyond it. But in mines when the lode-channel is large, this is often a very expensive method, as the cross-cuts must be hundreds of feet in length to get to the hanging wall. Hard slips are met with, carrying gouge and quartz, resembling the vein and making it impossible to be certain that they are the main hanging wall, and that there may not be an orebody beyond. It is necessary to drive cross-cuts at comparatively short distances apart, for an orebody might lie between any two of them. But there are several ways to kill a cat, and the experienced miner knows that an orebody resembles a tree in that its feeders spread in all directions from the main mass. Whatever cause, whatever convulsion of nature opened the fissure so that a place was made for the ore deposit, it also made its pressure felt for hundreds of feet from the main ore deposit. It is an interesting study to examine the formation surrounding a worked-out orebody, and it is instructive also. There is generally, even in the same mine, something distinctive and characteristic about the formation of each individual orebody, peculiar to itself. Even the mineral constituting the separate orebodies will vary, and can be recognized by one familiar with the mine. It is interesting to follow, where possible, the drifts, raises, etc., leading to a worked out orebody. Test the filling of the fissure by panning, observe the formation and see just where the first indication of ore appeared. It will frequently be found hundreds of feet from the shoot. The pocket miner puts this knowledge to practical use in following the paystreak to the pocket. All quartz mines resemble each other in this respect, both gold and silver and some lead mines. The orebodies throw off their feeders just as the pocket does, and while it is often a difficult matter to follow them, if once a streak of gold quartz is found and followed it will sooner or later lead to ore, that is, in most mines. Some veins never were any good and never will yield an orebody. The feeders are there, but they do not bunch. These mines are strictly no good, but if a vein has made one good orebody it is a strong argument that it will make another. But it is often a delicate matter to follow these feeders. Many complications and difficulties are met with. One is literally groping in the dark. Much experience and judgment are required. It has often happened, especially in the old silver 'chloriding' days when men worked on the tribute system, that after a certain part of the mine had been considered thoroughly prospected by the company, a party of miners working on a lease of the ground and by following these little pay-streaks, would strike ore. Large and valuable orebodies have been found in this way, that probably would never have been found in any other way.

In the case cited, the cross-cut is being driven ahead and the old reliable gold pan is brought into play and everything thenceforth is panned and prospected. The development work goes ahead testing the vein, and every method known to modern mining is used to crowd the work ahead. Gasless powder is used. The steam-pipe to the pump and water-column are tapped, and a steam-jet and small water-pipe are run to the face. Extra men are put on to throw back the waste, to lay track, pipe, etc., so that a cross-bar can be set up at once and the back holes drilled while the waste is being shoveled. The best men, the pick of the mine, are put on the job and no expense is spared to rush the work in every way possible. The panning goes on, but not a color of gold is found and the assays yield nothing. A water-hose is run out to the end of the waste-dump and carloads of the muck are washed over to get a good look at the formation, but it looks dry and dead. The panning goes on, and finally one morning a tiny speck of gold is seen in the pan. Where did it come from? More pannings are made, but with no results. Finally a pan is washed with several little specks in it and in the washings is found a little piece of a bluish looking quartz, not a quarter of an inch cube, with a speck of galena in it. Down in the mine goes the superintendent and every inch of the last round blasted is gone over with painstaking care. Ah! Here it is! A tiny streak of gouge, not thicker than a knife-blade! He tries it with the point of his candlestick and finds a little grit. A handful is taken on top and carefully panned, and he sees something that sends a thrill of exultation through him. None of your little specks this time, but a good prospect! Plenty of fine gold and a few coarse colors! But he is suddenly chilled with the thought that it may be coming from the ore above; that it is nothing but the drizzle end of that ore giving out. Never mind, it must be followed, so down in the mine he goes and gives his orders, "When you set up again, boys, put your round in the cross-cut and drill another round here in the side from the same bar. We will start a drift here"; and the drift is started following the paystreak. These are anxious days for the superintendent and his foreman. The men share in the tension. They realize the importance of the work. They know why they were put there and what is expected of them and they bend their brawny muscles over the throbbing drill and work as men nowhere else do underground. The drift goes ahead, following that tiny thread of gold as it turns its tortuous way through the formation. Other seams and slips come in, but the right one must be picked out. The 5-ft. rounds frequently leave it to one side or the other, but it must be found again. The "old man" has left word that he is to be called whenever they blast, day or night, and when the watchman raps lightly on his window and says, "You are wanted below, sir, they just blasted," he is up and down in the mine again to find that the last round lost the streak. A slip has cut it off, slick and clean. Now begins a hunt to find it. Which way did the slip cut it? From this way, of course. He gouges in on the slip and pans the gouge on a shovel-blade. There is the gold. He drills on the slip, several rounds, maybe, following the gold. Finally the slip does not pan any more and he looks for the pay-streak. There it is. He knows it at a glance this time. The same tiny streak of gritty gouge. Ahead again, and so on through all its erratic, winding course he traces and follows it with skill and patience; sometimes lost for days at a time, but always picked up again. Finally it begins to assume something of a definite shape. The walls become more regular and distinct; the gouge is thicker, more water follows the streak and there is more quartz showing up. It continues to improve. More water comes in. The quartz is soon a foot thick and prospects fine. A hay-maker could follow it now. The "old man" gives orders to blast the waste first, muck back, blast the ore and send it to the mill and says, "Boys, I think we have made a strike here." He writes to the company that good ore is coming into the south drift and it looks favorable. It is all ore now and all going to the mill. The plates brighten up. The ore from the drift is sweetening the low-grade ore from the other stopes and the mill-boss says: "Can't you give us a little more of that rock from the bottom? That's good stuff."

When he goes to the bottom and stands in the drift running through the orebody, a feeling of pride and satisfaction comes over him. He was right. His judgment was correct. It is a strike, sure enough. There is no doubt of it. He feels "some proud" as he surveys the length and breadth of it. There is ore enough in sight to insure the prosperity of the mine for several years to come. He feels a personal interest in it. He found it and he knows how easy it would have been to have missed it many times, and that the ore might have lain undiscovered for years and might have never been found.

This is one way to find ore. It is going back to first principles. It has this advantage: It does not necessarily require a chemist, a geologist, or a mining engineer to do it.

Mining in the High Sierra.—There are a large number of 'base-ore' deposits in the Sierra Nevada, in California which only require capital, development, and modern metallurgical methods and machinery to make them profitable enterprises. Although these ores are usually spoken of as 'base,' they are mostly the ordinary sulphide ores in quartz gangue, generally consisting of the sulphides of iron, copper, zinc, and lead, together with silver and gold, arsenic, and occasionally antimony is found in some of these deposits, but they are in no sense more difficult of treatment or of less value than many of the ore deposits that have been successfully worked under similar conditions for years in Colorado. They are situated at high altitude—8,000 to 13,000 ft., being mostly between 9,000 and 11,000 ft.; but mines are being worked in Colorado at this altitude, and even much higher, with no particular regard to the hardships of the situation. The Californian is accustomed to mines at lower altitudes—1,000 to 3,000 ft.—and the high Sierra has few charms for him. The Colorado, Montana and Idaho miners look upon long winters, deep snows, high winds, snowslides, and the other vicissitudes of high altitude as a matter of course and are satisfied if the mine will yield a profit, as a great many of them do, under these disadvantages of climate and isolation.

Detection of Adulteration in Cement.—The simplest test for adulteration is to examine the cement under a small three-lens pocket magnifier. To do this, spread the residue obtained by sieving 100 to 200 grams of cement through a No. 200 sieve on a piece of black glazed paper and move the lens over it. The particles of well-burned clinker will appear black or brown in color, and of a waxy or vitreous luster, and spongy looking, resembling coke or gum arabic. The particles of clinker are always rounded. Slag usually presents a greenish of bluish color, and the edges of the particles are much sharper than those of the bits of cement clinker. Limestone and cement rock, if present, are in flattened particles, and the latter is always dark gray in color. Both of these may be readily detected by effervescence with dilute acids. The foreign particles may also be picked out of the residue with a pair of tweezers, ground finely and identified by chemical analysis. The residue from the sieving will also contain particles of flint from the tube-mill pebbles, if these have been used to grind the cement, or splinters of iron, if Griffin mills are used. Neither of these can, of course, be considered as adulterants and both can readily be identified; the former by the fact that even when finely ground it is insoluble in hydrochloric acid, and the latter by its magnetic properties.—The Chemical Engineer.

Unusual Shaft Sinking.

In a paper contributed to the Institution of Mining & Metallurgy, London, Edgar A. Collins, the manager of the Combination mine, at Goldfield, Nevada, gives interesting details concerning the sinking of a shaft on an extraordinarily rich body of gold ore. Mr. Collins says that the ore-shoots of the Combination mine are typical of the district. They are closely associated with the irregular masses of shattered and silicified quartz andesite or dacite, which have intruded through the decomposed porphyritic country rock, an altered andesite.

The rich ore seems to follow the lines of greatest fissuring. The rich ore usually occurs either in irregular seams traversing the silicified mass in a direction roughly parallel to its greatest dimension or else in the form of small lenses and bunches. The contents are usually soft iron-stained kaolin, with shattered and brecciated quartz and irregular fragments of dacite. The richest mineral is usually in the kaolin, in the oxidized zone; in consequence it can be concentrated to a large extent by screening over an ordinary fine grizzly.

The shaft was sunk with the idea of prospecting a small bunch of exceedingly rich ore which was found on the surface, by trenching across the outcrop. At the point of discovery this bunch did not appear more than three or four feet long, but after sinking a few feet the pay-streak showed itself to continue for the full length of the shaft, varying in thickness from six to 18 inches.

In order to keep the ore as high grade as possible, the rich streak was taken out first, and kept fairly clean from the low-grade rock on either side. The latter was then broken by itself and sent to the mill bins. As sinking progressed, it was seen that the very rich ore occurred in small bunches of irregular shape. Between them the silicified dacite would sometimes be blocky, and in such cases very poor, or it would be traversed by innumerable little stringers of a soft heavily iron-stained decomposed stuff, in which case the ore would vary between the two extremes. As a result of this, samples taken from each end, and three feet apart, would vary enormously, one sample assaying, say, $10, while the next would assay as high as $1,500.

While sinking was progressing in this prospect shaft, the 130-ft. level from the main workings of the mine was extended toward it, the vein being finally cut within a couple of feet of where it was expected. This showed an unusual regularity in dip, as compared with other rich streaks of ore found in the mine.

At this depth (128 ft. vertical) the vein was quite different in appearance. Instead of being entirely within the silicified dacite, the ore was found just beyond but closely following it in dip and strike. The characteristic yellow-stained brecciated quartz was replaced by yellow-stained decomposed porphyry, with unusually coarse crystals of kaolinized feldspar, and blotches of almost pure iron-stained kaolin. Both the decomposed porphyry and the kaolin assayed high, but the last-named was far the richer.

Between this material and the country rock, and separating the bunches of rich kaolin, the vein-stuff consisted of highly silicified dacite and quartz, which however, was almost valueless. As a result of this, practically all the rich stuff became fine when blasted. By running the broken ore over a grizzly with bars set ¾ in. apart, and with the space under the grizzly divided into two bins, by a transverse partition about half way up, three different products were obtained, namely: (1) Very rich fine; (2) Low-grade coarse; (3) Intermediate size, of intermediate value.

This shaft was in ore for its full depth. Between the zone of greatest enrichment (in this case the first 70 ft.) and the rich ore found immediately above the 130-ft. level (say 30 ft. above the track) there was a poorer zone, composed of less shattered dacite, in which practically all the rich ore was contained in thin seams, in every direction.

The total value and tonnage of the ore extracted from the surface croppings down to the back of the 130-ft. level, a distance of about 122 ft., was approximately 309 tons, valued at $159,000. This was distributed as follows:

	Tons.	Average Assay Value Oz.
Shipped to smelter direct	103.0	42.6
Treated in mill and then shipped	58.7	54.8
Sent to various stock piles	147.8	2.3

The above figures refer to gold alone, the silver content being insignificant, the ore averaging only one ounce silver for each 20 oz. gold.

Additional development work brings to light the fact that this extraordinary shoot of ore is almost insignificant in length, so that it may be likened to a pipe, with the shaft in the center.

Iron Mining on a Big Scale.

All signs indicate that this is to be a record-breaking year among the steel-makers. Railroads are ordering thousands of tons for use in extensions and the re-laying of existing tracks. Forty-two thousand tons are needed for one of New York's bridges. Elsewhere bridge-building and rising skyscrapers in scores of cities help to swell the demand. And in addition, steel must be supplied for the re-building of San Francisco. This activity in the steel trade means that there will be even busier times than usual on the ranges north of Duluth where material for skyscrapers and bridges is dug from the earth. From these deposits comes the bulk of the high-grade iron ore used in the steel-making industry. Last year there were shipped from the Duluth customs district 21,830,885 tons of what to the uninitiated looks like a reddish brown gravel mixed with pebbles and small stones of the same color. This is the ore which has made the Mesabi and Vermilion ranges famous among miners and iron-workers the world over.

The visitor to the Minnesota ore fields is likely to have his ideas of mining methods suddenly altered. He has thought of a mine, perhaps, a shaft leading down to galleries far beneath the surface of the earth. There are such mines in this region, but its distinctive feature is open-pit work. An open-pit mine is well described by its name. It is a hole in the ground and some of these cavities dug in the face of the landscape are so large that they resemble craters of great extinct volcanoes.

Take the Mountain Iron mine, for instance, from which, in 1905, 2,495,089 tons of ore were shipped. It is so deep and so long that a string of railway cars seen at a distant point in its depths looks no bigger than a toy train with which a child plays upon the nursery floor. This artificial valley is more than half a mile in length and its average breadth exceeds a quarter of a mile. There is a point where from the grass-roots to the bottom of the pit the distance is 225 ft. and the average depth is 150 ft. Ore has been shipped from the Mountain Iron mine for only 14 years, although it is one of the oldest on the Mesabi range, yet in that time a total amount exceeding 12,000,000 tons has been sent away to be converted into the steel on which run the trains of great American railway systems and which forms the frames of towering skyscrapers and mammoth bridges. Last year on the Mesabi and Vermilion ranges ore was taken from 71 mines, ranging in size from that which produced less than 1,000 tons to the eight which sent out over 1,000,000 tons each.

The mines are scattered in groups. Here and there rise, tall and gaunt, the shaft-houses of the underground workings. There is everywhere a tangle of railway tracks, running from mine to mine and down into the pits. It sounds like a continuous Fourth of July celebration, for rock and ledge must be blasted away when they obstruct the work and the reports of dynamite charges boom like giant cannon crackers. Nothing is allowed to interfere with the mining operations. Land is sold here with the ore rights reserved and in at least one instance an entire town has been moved bodily out of the way. This happened to Eveleth, a town of several thousand people. The streets were lighted by electricity and the place had its sewer system and public water-works. But Eveleth stood over a deposit of valuable ore and so it was rebuilt at a point on a hillside some distance away from which it now looks down on the mine workings that mark its former site.

Mining on this mammoth scale has brought prosperity to the range towns. Brick business blocks stand in the midst of the houses of the mine workers and, as it is still a new country, log cabins are sometimes found in the shadow of hundred thousand dollar schoolhouses. Three railroads extend from the mines to Duluth and they are busy lines.

During the eight months of the year, when navigation is open on the Lakes and the mines on the ranges are working full blast, the man who stands at the edge of one of the great ragged holes torn in the ground by the energy of giant steam-shovels, some of which lift six tons at every stroke, sees far below on the railroad tracks, which seem to roam in hit-or-miss fashion through the pit, long lines of ore-cars drawn by locomotives as large as those which haul the freight trains on many railroads. Such a train comes to a standstill by the side of one of the steam-shovels. With a few movements of its mighty arm, the shovel fills a car which holds from 35 to 50 tons of ore. As car after car is filled, the train is moved along jog by jog, and when the work of loading is completed it is hauled up the incline from the pit to the surface of the ground. There at the edge of the mine it is turned over to one of the ore-carrying roads and sent away on its journey to the shores of Lake Superior.

For transferring the ore to vessels, great docks have been erected. These ore docks are unlike any other type of cargo-handling appliances in the world. They rise 60 to 70 ft. above the water and some of them are half a mile long. At the top are the railway tracks, on which are run the ore-laden cars. Their contents fall into huge pockets, and thence, through chutes, to the holds of the waiting vessels. All told, the docks of Duluth and its associated ports from which shipments of last year were made, have a capacity of 681,440 tons and a water frontage of something more than seven miles, and additional docks are now being completed. To carry the ore eastward last year it required 892 vessels, more than three times as many as the craft of all classes now fit for service in the United States navy, and this great lake fleet transported 3,807 cargoes.

From the time operation begins in the spring until navigation closes, work in the open-pit mines goes on with few interruptions. At night electric lights flare in the depth of the excavations, and always there is the rumble of long trains and the clanking of the chains and creaking of the machinery of the great shovels.

All of the digging done by the steam shovels does not bring out ore, for before the precious reddish brown material is reached, the earth must be removed or, as the mine men say, the stripping must be done. There are places where the ore is found only a few feet below the surface; in others, the rock and earth must be taken out to a depth of 75 ft. before the ore is reached. This earth is hauled away in cars to places where tests have shown that no ore is likely to be found. There it is dumped in great piles. Near the town of Hibbing on the Mesabi range, one of these dumps, which looks like an artificial hill a hundred feet or more in height, has been selected as a house lot by a man who apparently wants to live in a place with a good outlook of the surrounding country.

While in the open-pit mines business goes on only during the navigation season, the underground mines work the year round, during the winter piling the ore at the mouth of the pits so that in the spring there are scattered about the landscape red-colored hills which during the summer disappear and are loaded by the steam-shovels. The underground workings are sometimes conducted in connection with open pits, becoming in that case what are known as milling propositions, the ore dug in the pit being hauled through tunnels into the old workings and raised to the surface through the shafts.

These ranges, which have made Duluth the greatest ore-shipping city in the world, are places where there is little use for the man with the pick and shovel. It is a region where vast results are obtained by the use of great power. Up to the present time these operations have been dependent upon the energy of steam. Now, however, with the completion of the great hydraulic development near Duluth, which, combined with electrical transmission, will supply power to all the region roundabout, it is likely that electricity will do much of the work on the ranges, in addition to running trolley cars, lighting streets and supplying power for many purposes in Duluth and other cities.

While the output of the mines will increase rather than diminish as the years go by, the men who are digging iron ore on the Mesabi and Vermilion ranges are at present setting a pace which, if it could be followed by the canal builders on the Isthmus of Panama, would join the Atlantic and Pacific in a shorter time than has been estimated as needed for the undertaking. The 21,000,000 tons of ore which constituted last year's shipments from the Duluth district would make about 11,000,000 cubic yards. When the majority of the engineering board reported that to build a sea-level canal across the Isthmus of Panama, a task requiring the removal of 110,000,000 cubic yards of material would take ten years the minority of the board declared that the excavations would not be made in less than 15 years. Yet the work could be done in the shorter time if the material were taken out as rapidly as the iron ore is dug from the earth on the range north of this city. The output of the Mountain Iron mine last year exceeded by 400,000 cubic yards the amount of excavation done in 1905 in the Culebra Cut. If the ditch diggers on the Isthmus excavated as rapidly as do the miners on these ranges, the lock canal which is favored by the majority of the board of commissioners could be excavated in five years instead of the seven and a half years estimated.*

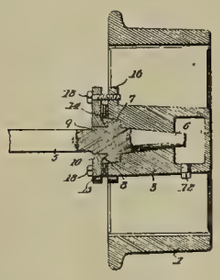
*From the Mining Gazette, Houghton.

Mining and Metallurgical Patents.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

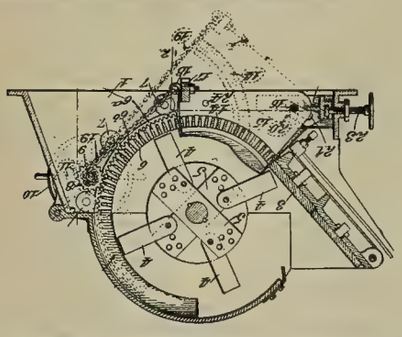
MINE-CAR WHEEL, No. 818,108. J. J. McCully, Mexico, Mo.

The combination with a mine-car wheel, of a spindle having a collar provided on its outer face with an approximately V-shaped circumferential seat, a dust-guard having a flange corresponding to the shape of the seat and fitting therein, washers interposed between the dust-guard and the wheel-hub, and means for assembling the guard with the wheel.



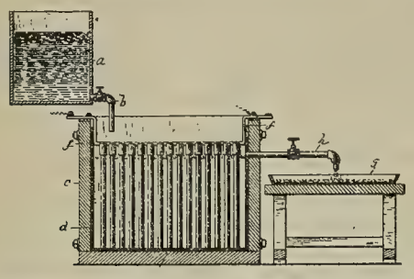
TUBULAR BALL-MILL, No. 818,211. M. F. Abbe, New York. N. Y.

A tubular ball-mill composed of a rotatable cylinder, inclosed pebbles, a power-shaft, means for suspending the cylinder from shaft, a sustaining-shaft journaled sidewise from the cylinder, and means for rotatably connecting the cylinder to the sustaining-shaft.



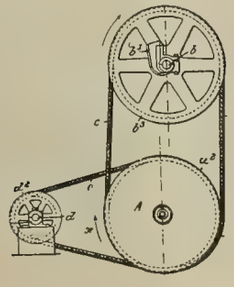
PROCESS OF RECLAIMING WASTE GOLD AND OTHER VALUABLE METALS FROM WATER AND OTHER LIQUIDS, No. 818,174. C. E. Holland, New York, N. Y.

The process of reclaiming gold or other precious or valuable metals from water or other liquids, consisting in conducting the stream or body of liquid to an electrolytic apparatus, subjecting it to electrolysis, in the presence of a body capable of forming a coagulum, and collecting the coagulum produced thereby.



DUMPING-GAGE FOR CRUSHERS AND PULVERIZERS, No. 818,725. M. F. Williams, St. Louis, Mo.

In a machine of the character described, the combination with a grinding-surface composed of sections, one of which is pivotally mounted, means for adjusting the pivotal support for section, means for swinging section on its pivot, means being also operatively connected to other sections to move the same.

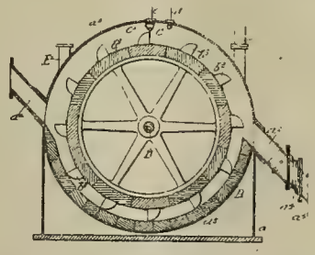


HAMMER-DRILL, No. 818,638. W. Prellwitz, Phillipsburg, N. J.

In a hammer-drill, a hammer-cylinder, its tail-rod and a protective casing having its walls entirely spaced from the cylinder, the cylinder and tail-rod having sliding engagements with and supported only by the ends of the casing for the purpose set forth.

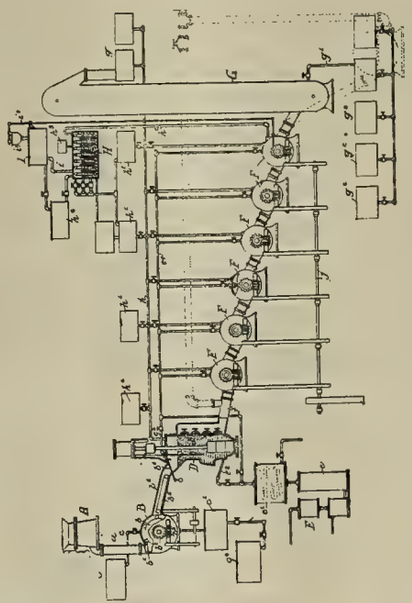
LIXIVIATOR, No. 820,812. Sidney T. Muffly, Philadelphia, Pa.

A lixiviator consisting of a containing-receptacle having an inlet and an outlet, a revoluble structure within the receptacle having pulp-carrying means, with a wooden lining within the lower portion of said receptacle.



PROCESS OF EXTRACTING PRECIOUS METALS FROM THEIR ORES, No. 820,810. Sidney T. Muffly, Philadelphia, Pa.

The process of treating ores which consists in pulverizing said ores while they are immersed in a solution capable of dissolving the contained gold and silver, said solution being exposed to air under pressure greater than that of the atmosphere.

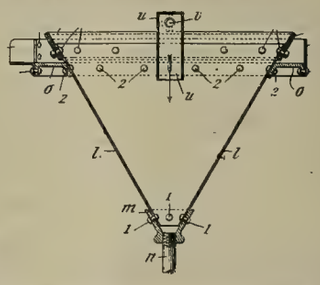


BLASTING-POWDER, No. 820,854. B. Eberle, Passaic, N. J.

A blasting compound consisting of four pounds saltpeter, one and one-half pounds chlorate of potash, one and one-half pounds of sugar, three ounces of phosphorus, three-fourths pound sulphur, and one-half pound manure.

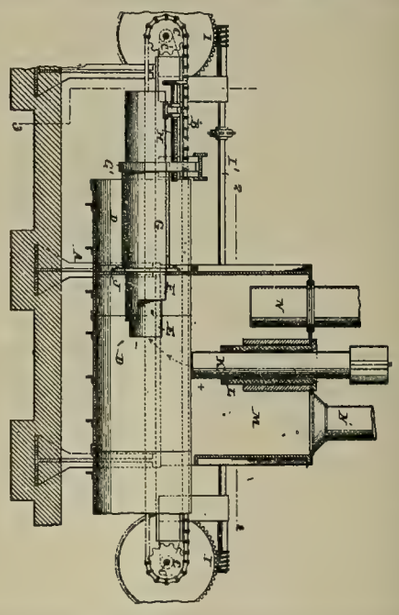
CLASSIFIER, No. 820,934. Charles W. Merrill, Lead, S. D.

A classifier provided with an overflow-line of soft metal extending around its entire periphery.



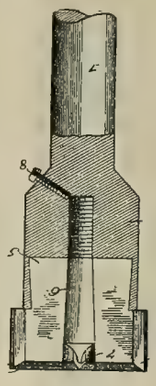
ELECTRIC FURNACE, No. 820,574. James E. Hewes, Plattsburg, N. Y.

In an electric furnace, the combination of a trough-like hearth for the materials to be smelted having side flanges, two electrodes arranged at an angle to each other one of said electrodes being in alinement with the length of the trough-like hearth, two side guides B' on each side of the hearth, endless traveling chains or conveyers B B traveling over and resting above said guides and directly supporting the flanges of the hearth.



ROCK-DRILL, No. 820,530. William Sturm, Chicago, Ill.

A rock-drill comprising a shank, a plurality of removable cutters arranged on opposite sides of the center of the drill said cutters being provided with peripheral cutting edges, and a central locking device for locking said cutters in their sockets, said locking device being also provided with a cutting edge located between oppositely-disposed cutters.



PROCESS OF MANUFACTURING IRON DIRECT FROM ITS OXIDES, No. 820,898. James N. Whitman, Philadelphia, Pa.

The improvement in process of manufacturing iron direct from its ores, which consists in comminuting and mechanically purifying the ore, then subjecting the comminuted ore to heat under oxidizing conditions to eliminate volatile impurities, then subjecting the ore to heat and agitation under deoxidizing and carburizing conditions produced by the introduction of free carbon, to partially deoxidize, partially reduce and agglomerate the ore into coherent masses.

Special Correspondence.

JOHANNESBURG, May 7.

All classes of the community are excited over the arbitrary action of the Home Government in regard to the repatriation of the Chinese. During the last political campaign in England, the Liberal Party, then out of office and thirsting to get in, used the cry of "Chinese slavery on the Rand" for all it was worth. No lie was too mean for them, no trick too contemptible. The Liberals got in, and people here thought that as they had gained their object, they would drop the Chinese question. But they have pestered us ever since their accession to power. Things have come to a critical point. The Home Government insists on posting notices in the compounds, telling the coolies that they can return to China at the expense of the Government, if they show good reasons.

Was ever anything more unjustifiable? Did ever Government make a move so fraught with disaster? Here is an ordinance, duly agreed to by the King and the Emperor of China, by means of which coolie labor is to be supplied to the Rand. The Chinamen have entered into a three years' agreement with the mines. The Liberal Government steps in, utterly disregarding the legislation of their predecessors in office, and interferes in a private contract between the coolies and the mining companies. By the repatriation of all the Chinese the majority of the people of the Rand would suffer, some irreparably. Even the departure of one-fourth of the coolies would cause great distress. There are not sufficient Kaffirs to work the mines, and many of them would be forced to close down if the Chinese went. It is becoming more and more difficult to get Kaffir labor. It requires little to make the native a well-to-do man, and in Zululand, Zwazieland and Basutoland, the blacks are fast becoming independent. The great inducement for coming to the Rand, which once existed, namely to earn money to buy whiskey, no longer exists, as the Government has almost entirely stamped out the liquor traffic among Kaffirs. It has been proved that under present economic conditions, it would be impossible to employ white labor solely, save on a few high-grade mines of the Central Rand. If the Home Government is desirous of closing down the mines, the surest way to do it is to make an offer of repatriation to the coolies.

Seeing the disastrous nature of the proposals, it is not to be wondered that meetings of protest have been held here. What everyone asks is, "How many coolies will take advantage of the offer?" Needless to say people here will use every legitimate means to defeat the proposals of the Government. It is probable that the mines will out-maneuver the authorities, and that only a few coolies will go back to China. The indignation is over the principle of the thing.

The mining companies have taken up a bellicose attitude, and have written to the Government refusing to post the notices in the compounds, on the ground that the notices are illegal. How the Government will retaliate is not known. Force might be used to post the notices and keep them up. Altogether it is a red hot situation, and developments should be distinctly interesting.

LONDON, May 23.

Judging from the flowery periods in the county press and the warmth of the debates amongst the old hands at the Cornish mine meetings on the subject of 'cost book' versus 'limited liability,' the unthinking uitlander might be tempted to the conclusion that the unaccustomed shouting of prices on the Redruth Exchange had engendered a thirst which caused more than the usually moderate libations to be poured forth at the local shrines in honor of the leading favorites. It seems true that numerous and quite reckless bargains for the rise have been made in the home markets lately, and the 'adventurer' in the sweet West country may be pardoned, amidst such scenes of new-born enthusiasm, if he imagines that the excitement has also stirred the too stagnant waters of the London mining market. But for the present the list of successful tin mines is too meager to create a ferment in that center. There are not enough shares to go round. This could easily be gathered from the best list that can be produced of the active mines, nine in number. Here it is:

	Capital.	Price per Share. Beginning of 1906.	May 18.
Limited Liability—			
Basset Mines	£120,000	3s. 6d.	10s.
Clitters United	160,000	17s. 6d.	21s. 6d.
Carn Brea & Tincroft	150,000	6s.	9s. 9d.
Dolcoath	350,000	12s. 9d.	26s. 3d.
Cost Book—			
East Pool	6,400 Shares	£2⅜	£10¾
Levant	2,500 " (or less)	8¾	15¾
South Crofty	6,120 "	1	2¼
West Kitty	6,000 "	2⅝	6¼
Wheal Grenville	6,000 "	9	12 x. d.

London, although calm, is not unobservant of Cornwall's possibilities, and it may be taken for granted that with the continuance of anything like the present price of tin, the list of producing mines on the limited liability principle, will be found to increase. Some solid progress toward this end has already been made, as readers of this correspondence are aware. It will, however, be a matter of time before the great financial groups can be convinced that there is sufficient scope for their energies in re-opening the partially worked abandoned mines. Virgin ground must be prospected and proved by other means, for the promoter in these days prefers to buy ore reserves which he can turn over to a company at a profit. On the other hand it is not all smooth sailing for the "honest broker." The 'lords' dues' take some of the sugar off the cake to start with; one-fifth of the profits is not considered excessive. According to well-informed opinion a trouble in front of Cornish mines will be what it is in South Africa—the want of labor. The supply is not considered too great at the present time, and it is feared that it will be less plentiful when the numerous other mines are set to work, which are now being talked about. Most of those employed in the mines at the present time are said to be the young men and the men advanced in life. Those of middle age are abroad, working in all parts of the world, but chiefly in Africa. There is so much activity in Cornwall now that a good many of these men are returning, but it is scarcely likely that, having received the scale of wages common in South Africa, they will resign themselves to the comparatively low rates of pay that rule in Cornwall. The mines must be prepared in the near future to pay somewhat higher wages than they have been in the habit of doing.

In view of this, mine managers are exerting themselves to do away with hand labor as far as possible. The rise in wages, should it come, will thus in large measure be compensated by improved appliances, which are now to be seen in the leading mines in the county. In tin-dressing alone it is said there has in this way been an enormous economy of labor.

It is thought the 'cost book' system is to all intents and purposes dead. Such seems to have been the opinion of Wheal Grenville 'adventurers' at their meeting last week when a lively wake was held around the corpse. One of the old hands, a large shareholder who spoke strongly against 'limited liability,' in addressing the chairman said it was a question if some of his colleagues could tell a working-barrel from a poppet-head. He knew others on the board who had not joined because of the paltry remuneration they received, and he firmly believed that they could develop its mineral resources for the interests of the shareholders; but still he could take some of their co-directors and ask them what is a poppet-head, and what is a working-barrel, and they could not tell him.

As an indication of the local feeling against the adoption of 'limited liability,' when the resolution in its favor was put to the meeting 22 voted for it and 24 against, but a poll was taken which by counting the proxies, resulted in a large majority of votes for the resolution. In the course of discussion the Company's legal adviser, Mr. C. V. Thomas, explained the disadvantages of the 'cost book' system. He said: "Eleven years ago I had the honor of being asked to consider whether or not it was possible to convert a cost book into a limited liability company, for that was a position very much controverted and bid fair to be fought out; but after obtaining the best advice I could, a plan was evolved for Dolcoath whereby we could convert a cost book into a company with limited liability. The lines I had the honor of laying down in that case were found to be successful, and have never been challenged since. I carried them out also in Carn Brea and Tincroft, Killifreth and Basset, so that the steps we think necessary to take in this case are very clearly defined and present in themselves no difficulty. There is no method known whereby a cost-book company can sell its undertaking except by public auction, and that only under the laws of the Stannaries Courts. It is a cumbersome kind of machinery admirably suited for a few friends who can rely upon each other, and between whom the ties of honor and friendship are strong. But when a cost-book company is on a basis other than this, then it is the worst devised system in mines, for no one at a given moment can know who his partners may be or what his liabilities are." The remarks on the same subject by one of the directors are also worth quoting: "I like the cost-book system, and any merchant ought to like it. He is safe, but there are drawbacks. In shallow mining the cost-book system was very well, particularly when the partners knew each other, but would you put your money into a foreign mine on the cost-book system, not knowing who your partners were? If not, then how can you expect outsiders to come here on similar terms? There was a mine near here and we asked the shareholders to submit to a call to carry out certain work. We had to face relinquishments, and speedily the 6,000 shares became 3,000 and the mine had to be abandoned, or the attempt made to float it as a limited company."

Mr. C. Algernon Moreing, who has been on a visit to Broken Hill, when referring to the future of that district, is reported to have stated that Broken Hill has entered upon a stage of prosperity which has never been equaled in its past history; and this has been brought about by the development of numerous processes for the recovery of the zinc in addition to the lead and silver. By the operations of the Zinc Corporation, practically new zinc mines have been created out of what were formerly only waste products. The value of the field has been probably doubled, and its permanence for a great number of years assured. He was highly pleased with the outlook of the Zinc Corporation. Although the company has been only six months in existence, it is already producing marketable produce, and is selling the same to Germany on a profitable basis. With regard to the South Blocks mine, he had been struck by the rapidity in which the opening of the mine and the installation of the plant are taking place. He could safely say that this mine will rank with many of the present big mines in a shorter time than many people anticipate. The Australian Smelting Corporation will be an immense advantage to all those Broken Hill mines which do not own their smelters. He hoped the smelting company would be doing business by the end of this year.

The following returns have been announced from Mexican mines:

Dolores, March; bullion account, $26,403.70; sundry receipts, $133.53; expenses for month, $14,618.38; profit for month, $11,918.85, representing the return from amalgamation alone, as the cyanide plant is not yet complete. Ore crushed: Mill, 781 tons. Value recovered by amalgamation alone, $33.98 per ton. Owing to lack of mine-cars and other supplies there was a shortage of ore sent to, and treated at, the mill during the month.

Esperanza, April; The mill ran 30 days and crushed 12,561 tons of dry ore. Shipped to smelter, 3,844 tons of dry ore, estimated realizable value of bullion produced, $136,767; of concentrate, $74,817; of ore shipped to smelter, $282,484; receipts from rents and other sources, $519; total, $494,587. Less working expenses, including development, marketing of bullion and freight and treatment charges on ore shipped to smelter, $212,936; allowance for depreciation of plant, $2,500; consulting engineers' fees and New York office expenses, $2,567. London expenses about £250; estimated profit, £56,427. Of this there has been expended on construction account, $5,179, or £1,061, and prospecting on Suceso property, $4,088 or £838. Feet of development work, 909. The shortage of railway cars still continues.

El Oro, April; The No. 1 and No. 2 100-stamp mills each ran 29 days, and together crushed 22,186 tons of ore, producing $192,599, less working expenses, $89,655; development expenses, $8,742, making $94,202. Profit from the railway for the month, $3,000. Total, $97,202 or £19,440, less estimated monthly expenses in London, and manager's salary, £700; leaving a profit for the month of £18,740. The sum of $20,308 was expended during the month on permanent improvements.

DENVER, June 4.

It is too bad that so much mining energy, brains and money has to be dissipated in law-suits. Just now the Clipper Mining Co. and the Searle Placer people are fighting it out in Leadville. Each side has 27 witnesses, that is 54 men. Each side has three attorneys, that makes 60. Then there are the parties interested, about four to the side, that makes 68. Say the average time spent on the case is ten days, that makes 680 shifts of work—680 shifts of work diverted from enriching the world by increasing its mineral output and devoted to impeding the procession and stirring up a cloud of dust. Look at it another way: I suppose each side will spend $40,000 to $50,000 on this suit, say $90,000 all told. How many prospects there are which $90,000 would convert into profitable mines that are lying idle for the lack of the equipment such a sum would provide. And what is it all about? In a nutshell, it is all caused by our poor mining laws. In 1877 Tom Starr located the ground since called the Searle Placer. Starr took it up as an addition to the City of Leadville, just as the townsites of Goldfield, Bullfrog and other new townsites have been taken up, except that he took it up as a placer claim. Now the way I understand the law he could not have taken this ground up legally in any way at all. It is in a mineral district, so he could not take it up as agricultural ground. There is no alluvial gold in it, so a placer location is not valid. To comply with the lode-location laws, he would have had to sink 250 ft. through wash and 250 ft. through lacustrine deposits in 60 days; quite a herculean task! Then he might not have found "mineral in place" even under

the liberal interpretations of our Colorado courts. Well, anyway, he located a placer; but he or his assigns were foolish enough not to keep peace with their neighbors and get a patent right away, so that when finally they did apply in 1881 they tried to sneak a lot of Freyer Hill, including the following mining claims, the Zulu, Bob Ingersoll, American Eagle, Grafton, Esmall, and Fairview. Naturally, the enterprise got into hot water and in 1882 an amended application was made, omitting a large part of the territory covered by the above-mentioned claims. But still there were objectors, and the Government sent Robert Berry out as special agent to investigate. On his report the Registrar and Receiver of the land office cancelled the application for patent on the grounds that the placer was located in fraud and the annual assessment work had not been kept up. But, and here lies the trouble (springing from the complexity of our laws), the land office did not cancel the location certificate when it canceled the application for patent. Since then the ground has been proved immensely valuable for lode mining purposes and in the 'eighties the Clipper Gold Mining Co. located four lode-claims on the discredited placer. In 1893 the Clipper Gold Mining Co. applied for patent and the Searle Placer was allowed to adverse them. The Searle Placer had already been declared a fraud and not entitled to a patent, yet it was given sufficient standing in court to adverse these lode-claims. The present hearing has finally resulted from the application for patent in 1893 of the Clipper Gold Mining Co. on the claims Capital, Clipper, Congress, and Castle.

The facts developed during the trial are briefly these: There is some gold in the gravel, but nowhere near enough to justify placer-mining operations. The expert testimony has been singularly consistent on both sides. Max Boehmer and Prof. Young are among the prominent expert witnesses on the placer side of the question, while Governor McDonald and Judge Owers turned up as partial owners in the Searle Placer; and Judge Owers aroused considerable interest by trying to explain certain judicial actions which he has taken in the matter at the time he was a part owner. Prof. George of the State University, Regis Chauvenet and George J. Bancroft are among the expert witnesses for the Clipper Gold Mining Co., and J. W. Finch is also expected to testify. Prof George's testimony regarding the glacial epoch in Colorado is probably as exhaustive a study of the question as has ever been made public and, regardless of the law-suit which evoked it, is a valuable addition to the sum total of human knowledge

The contention of the lode-mining people is that the gravel is glacial moraine and of the placer people that it is river gravel. However that may be, there has never been any serious attempt to work the gravels of Poverty Flats, on which the Searle Placer is located so the ordinary observer will pretty safely conclude that the ground is worthless as a location for mining alluvial gold. All the complexity of the United States mining laws as brought out in this case will serve as a very powerful argument, no matter which way the case is decided, for a complete revision of these laws. For instance, why should our agricultural industry have laws (governing the acquisition of government land) which evoke practically no law-suits, while our mining industry struggles along under such a heavy burden of litigation. The American Mining Congress has taken a step in the right direction, but the whole mining public must lend a helping hand if anything is to be done.

SALT LAKE, June 4.

The first shipment of concentrate from the Godiva mill, in Tintic district, has reached the Salt Lake smelters, and it is announced that the capacity of the plant will be increased by the addition of more tables. Jackson McChrystal, of Eureka, is manager.——The necessity for repairs at the Bullion-Beck mine of Tintic has caused a shut-down for a few days.——Ore from the Victoria mine is now being extracted through the 800 and 900-levels of the Grand Central mine near Eureka. ——The concrete foundation for the new hoisting engine of the Star Consolidated mine, at Eureka, has been finished.——A tunnel is being driven on the property of the Prairie Bell Mining Co. in West Tintic district.—— The Uncle Sam Consolidated management has contributed a car of ore to the School of Mines department of the State university for experimental purposes.

The Galena King Mining Co., at Stockton, will probably resume shipments soon. The mine has been idle for some time, awaiting the advantage of the Honerine drain tunnel.——The New Stockton Co., at Stockton, has reached a depth of 1,027 ft. with its shaft. It is the intention to develop the mine at this level before going deeper. J. J. Trenam, manager, says the output of the mine will be doubled within 60 days. The mill is running two shifts of eight hours each. A 10-ft. vein of lead ore, mostly of shipping grade, has been encountered in the Honerine drain tunnel, at Stockton. A drift has been run on it over 30 feet.

The Bingham Consolidated and Cluster Mining Co. have settled a dispute over apex rights to a claim in conflict. A proposition made by the management of the Bingham Consolidated, to ascertain the facts, at its own expense, by further development, was accepted by the Cluster management.——The Utah Apex Mining Co. is preparing to install a compressor at its Bingham mine. ——The Ohio copper mine, in Bingham, is being examined by A. Frank, of the staff of F. A. Heinze, supposedly for the Bingham Consolidated Mining Co. which has large interests in Bingham.——Track-laying has begun on the Rio Grande railroad extension over which the ore of the Boston Consolidated and other Bingham mines will be transported.——The directors of the Utah Apex Mining Co., operating in Bingham, have authorized the issue of $500,000 worth of 10-year bonds, bearing interest at five per cent, convertible into stock of the company at par—$5 per share, prior to January 1, 1907. A special meeting of shareholders has been called for the 28th inst. to ratify this action. It is said only $100,000 of these bonds will be issued now, the proceeds to be used in the purchase of an air compressor and other equipment, in the construction of an aerial tramway, and for the purpose of further development.

Connections have been made with the orebodies on the 300-level below the tunnel in the Columbus Consolidated mine at Alta. The company has 42 four-horse teams hauling ore. The management expects to realize $100,000 on the June shipments. It is believed the company will pay its initial dividend in July.——W. S. Zehring, in behalf of the interests identified with the management of the City Rock mine, at Alta, has secured a bond on the St. Louis-Alta group, an adjoining property.

Development work has begun on the Blue Bird property, near Milford, Beaver county, recently bonded to James F. Burns of Cripple Creek. It is said Mr. Burns has an option on the Indian Queen mine, near the Newhouse Cactus property in the same county.——The Imperial Copper mine in Beaver county is to resume; at least, that is the statement made by A. B. Lewis, president of the company. The Consolidated Mercur mine, of Mercur, handled through its mill in May the usual amount of ore—25,000 tons.

Development has been resumed at the Mt. Masonic mine at Park City, after a shut-down of several weeks. This mine is owned by Iowa capitalists.——The Daly-Judge Mining Co. has begun stoping the big orebody opened during the past few months on the 1,500-ft. level. The management expects to have all its obligations cleared up by July 1. The earnings are about $50,000 monthly at present.——The shareholders of the Woodside Mining Co. have ratified the sale of the property of that corporation, by the board of directors, to the Silver King Mining Co. at Park City. The raising of structural steel for the Utah Copper Co.'s new concentrator, at Garfield, has begun.——Much interest is being manifested in the Deep Creek mining district on the western border of the State, by Salt Lake mining men. Numerous properties have been bonded recently and indications point to increased activities in that section upon the building of the Western Pacific railroad westward from Salt Lake City——An important strike is reported made last week in the property of the Nevada Gold Butte Mines Co. at Gold Butte, Nevada. The company is developing its mine by means of a tunnel and a compressor plant is being considered. L. A. Copeland of Salt Lake is president.

SALT LAKE, May 31.

The No-You-Don't group, at Stockton, has been bonded to H. E. Smith of Duluth, who will organize a company to develop it.

The Columbus Consolidated, which has been shipping ore steadily for some time, on the advent of good roads, will increase its output.

The Honerine mill, at Stockton, is in operation, with one shift, at present. Later the force will be increased, both in mine and mill. Recent development in the mine indicates that the Honerine will soon become a shipper.

The management of the Ohio Copper Co. is making strenuous efforts to begin ore production at the Winnemuck, one of its Bingham properties. The underground workings are being re-timbered where necessary. The mine is said to contain a great deal of $25 ore.

Samuel Newhouse has returned to Salt Lake after having made an inspection of the Cherry Creek and other eastern Nevada districts, where he has secured options on several properties.

The directors of the Consolidated Mercur Gold Mines Co. have posted a quarterly dividend of $25,000 payable in July. The Sacramento Gold Mining Co., operating in the same camp, has also posted one of $5,000. The laying of the concrete foundations for the new Boston Consolidated mill, at Garfield, has begun.

E. W. Clark, of Ophir, manager of the Overland mine, at Sunshine, is authority for the statement that ore sufficient to keep the company's mill going for a long time has been exposed, but it will be several weeks before he will begin stoping.

At the recent annual election, the following officers were chosen to serve the Shawmut Consolidated Co., operating at Bingham, during the ensuing year: Leslie C. Weed, president; William Rotch, vice president; Robert A. Jackson, secretary and treasurer, all of Boston. A long tunnel is being driven to open the orebodies of the Cuba. The sixth MacDougall furnace at the Yampa smelter, at Bingham, is in operation.

The management of the Mammoth mine, in Tintic mining district, has decided to sink to the 2,260 level. ——Ore shipments from Tintic district last week aggregated 175 car loads, the shippers and amounts being: Ajax, 4; Black Jack 8; Bullion Beck, 9; Beck Tunnel, 7; Brooklyn, 1; Carisa, 4; Centennial Eureka, 53; Dragon Iron, 12; Eureka Hill, 5; Eagle & Blue Bell, 4; Grand Central, 4; Gemini, 4; Mammoth, 19; May Day, 5; Ridge & Valley, 3; Swansea, 1; Star Consolidated, 4; Uncle Sam Consolidated, 6; Victor Consolidated, 1; Yankee Consolidated, 6.

BUTTE, May 26.

The drift on the vein of the Raven at a depth of 1,500 ft. has been extended 300 ft., the vein varying from five to 25 ft. in width. The average return from the ore taken out in development is 4% copper, 6 oz. silver and $1 gold per ton. The same vein has been developed on the 1,200-ft. level, and on both levels chutes are being put in preparatory to stoping and shipping. The company has for some time been hoisting 100 tons per day, and within a few weeks the amount will be doubled. The Raven Co. owns two mines, the Snoozer and Raven.

The Kessler mine, owned by the Butte & St. Louis Mining Co., will be equipped with steam hoisting machinery, pumps, etc. As soon as the plant is installed the company will begin hoisting ore.

The Washoe smelter will be enlarged to treat from 500 to 900 more tons of ore daily. The output from other properties and companies in Butte is also gradually increasing, and the smelter capacity of the district is being taxed. Additional smelters will become necessary if any of the new companies become extensive producers.

Options on a large tract of land on the Big Hole river, 40 miles south of Butte, have recently been secured by agents supposed to represent J. A. Coram and the American Consolidated Copper Co. which he is organizing.

The Amalgamated and Butte Coalition people are engaged in making a division of the ground and orebodies that for years were in dispute between the Amalgamated and United Copper, the latter the predecessor in interest of Butte Coalition, and as soon as the agreement is reached and each side knows what it is entitled to, work will be resumed on the mines that have so long been closed by injunction, including the Nipper, Snohomish, Tramway, Michael Devitt, Berkeley and others.

James Brown, a Montana mining man, is reported to have struck it rich in Nevada, in the new Catlin district about 40 miles from Caliente, where he located a dozen of the best claims.

W. A. Clark has opened a copper vein on the 1,900-ft. level of his Original mine. It shows a width of 17 ft. all good ore, four feet of it assaying 42% copper. Above the 400-ft. point the Original was a poor producer, but today it is one of the prominent mines in the district. The Original lies just west of the Parrot, and the latter adjoins the Anaconda.

The Parrot Mining Co. has decided to sink the shaft on the Parrot mine 600 ft. deeper. Work on it has been started. The shaft is now 1,800 ft. deep, and an additional 400 ft. will take it to the same depth as the workings of the Anaconda at the 2,400-ft. level, the collar of the Anaconda shaft being 200 ft. higher than that of the Parrot. The Parrot is at present hoisting less ore than at any time in its history.

The Amalgamated Co. is sinking three of its main shafts deeper. They are the High Ore, West Colusa and Parrot. The High Ore is being put down from 2,200 ft. to 2,400, and the West Colusa from 1,600 to 2,000 ft. The Boston & Montana is also sinking on the Greenleaf and has reached a depth of 280 ft. The same company intends to equip the Pennsylvania mine with a new hoisting engine. The one now in use has been doing duty for nearly 20 years, and is hoisting 1,000 tons of ore daily.

BUTTE, June 3.

From good authority comes the report that the Amalgamated Copper Co., or interests identified with that company, will purchase the Barnes-King gold mines at Kendall, Mont. Negotiations have been pending for some time and it is now understood that an option has been taken on the properties until next September, the price to be $1,500,000. A large amount of ore has been blocked out. The Barnes-King mines are considered one of the best cyaniding properties in the State. The principal owners are John F. Barnes, E. W. King and Joseph Underlin. It is expected that the new owners will enlarge the mill and increase the output of the mines. It is surmised that if the Amalgamated is the purchaser the Barnes-King company will be made one of the subsidiary companies of the Amalgamated, to be operated in connection with the holding company in the same way that its Butte copper companies are operated.

The Red Metal Mining Co., successor to the Heinze companies in Butte, is preparing to sink the shaft of the Corra mine 400 ft. deeper, the work to begin within a week. The shaft is now 1,800 ft. deep. A new hoisting engine, with capacity of working to a depth of 3,000 ft., was installed on the Corra by Heinze just before he sold out, and the surface plant is now in good shape for extensive exploration. After the 400 ft. of additional stoping ground is opened the shaft will be put down to 2,200 feet.

An interesting question is involved in a suit brought against the Washoe Copper Co. by the owner of some city lots and residence property over the Cambers mine workings, the action being one for damages on account of the sinking of the ground and cracking of the buildings due to the undergronnd workings. The case has been determined, so far as the district court is concerned, in favor of the Washoe Co., but the matter will be taken to the State and Federal Supreme Courts for the purpose of determining finally the relative rights of surface and mineral owners. The district court has decided that the surface of lots must be maintained in the natural and unbroken state, and that mining must be so conducted as not to interfere with the natural surface, but the support to be given the surface need not be sufficient also to sustain buildings on it. In other words, if the sinking and cracking is caused by the weight of the buildings and the ground would remain in its natural condition without the buildings on it, then the surface owner can not recover damages. If, however, the mining causes the ground to sink regardless of the weight of the buildings, then the surface owner can recover damages done both to the lots and the buildings. It is a question that has never been determined by the higher courts in Montana and is considered of great importance to both mining companies and owners of surface property, especially as a great deal of damage is constantly done to surface property by underground blasting and caving. Nearly the entire city of Butte is undermined, some of the biggest workings of the Amalgamated and Clark companies being directly under the business portion of the city.

The Reins Copper Co. is making rapid progress in its work on two cross-cuts from the 1,200-ft. point of the shaft, one being driven north and the other south. The former is supposed to be near the vein, as it is now in 80 ft. The exact position of the south vein is not known. There is a great flow of water in the cross-cuts, but so far, the company has been able to handle it with two pumps at the 1200-ft. station. It has been expected to strike the north vein within 80 ft., as on the 800-level it is but 40 ft. from the station.

The shaft on the Six O'Clock group, owned by the Butte Copper Exploration Co., has reached a depth of 625 ft. A station is being cut on the 600 while sinking continues. There is a flow of 100 gal. water per minute which the pumps readily control. Some stringers of ore apparently from near the walls of the vein, and pitching toward the shaft, have been cut, and the indications for striking an orebody appear to be good.

On the Greenleaf, adjoining the Six O'Clock mines, now being explored by the Boston & Montana Co., the shaft has reached a depth of 310 ft. From the 300 to the 1,000-ft. point the shaft will be three compartments, and later it will be enlarged from the 300 to the surface. The increased flow of water has made it necessary to make the shaft larger. At the 300 a water-saturated zone seems to have been tapped, for the water in a few minutes raised 40 ft. in the shaft, and the pumps for a time made little impression on it. The reservoir appears to have drained into the shaft, for in a few days the water decreased to the normal flow, which is about 250 gal. per minute.

The new hoisting engine of the Boston & Montana Co. at the Leonard mine is being placed in position. There will be eight new boilers of 250 h. p. each.—The machinery for the new engine and hoist of the East Butte Copper Co. has arrived at the Dutton mine and is being set up. The boilers are in position and the building has been erected over them. The surface work has not interfered with sinking, which has been continued with the old engine.——The shaft of the Butte & London Co. on the Greendale claim is now nearly 400 ft. deep. Work has begun on setting up the new hoisting engine. Four new boilers have also been received.

In the annual statement filed for record by the East Butte Copper Mining Co. it is stated that the company has no debts or liabilities, showing that its 134 acres of mineral ground has been fully paid for. It owns, according to the statement, the Dutton, Lassen, Hoy, Mary MacLane, Wheeler, Yankee Boy, Oneida, Jackson, Hancock and McDonald mines.——The Old Glory Mining Co. has taken up its option on certain interests in the Old Glory mining claim, the remaining interests being owned by the Butte Coalition Co. J. Benton Leggat, who organized the Old Glory, says he expects to resume work on the property soon, indicating that he has permission from the Butte Coalition to do so, as under Montana laws the owner of any interest in a mine can not operate the property without the consent of other owners. The Old Glory adjoins the mines of the Raven Co., and formerly the two companies worked in harmony through the same shaft, which they may now do again.

For many years a portion of the St. Lawrence mine has been on fire but the burning territory has been walled in and the fire prevented from spreading. As portions burn out and cool off they are opened and mined, large quantities of metallic copper reduced from the ore being found. The Anaconda Co. has been mining a portion of the burned ground and has been taking out slabs of solid metal. The fire has been burning since 1889, the sulphur supplying the fuel—a natural pyritic smelting process.

The Butte-Milwaukee Mining Co. has reached a depth of 60 ft. with the two-compartment shaft started on the Stonewall. The shaft is on a vein. Lessees have made one shipment of ore from the Pollock mine, one of the Butte-Milwaukee properties, that returned 15 oz. silver per ton, some gold and 2% copper. The property is well situated in the North Butte district and several of its mines were, years ago, big producers of silver. There is little doubt that the mines also contain copper.——The North Butte Co. has installed a large new compressor and the new hoisting engine will also be ready for use in a few weeks; the work of placing it in position is progressing rapidly.

DENVER, June 2.

The output of the Cripple Creek mines for May was 52,200 tons, an increase of 6,540 tons over April production. The published valuation of the May tonnage is $1,638,550.

A number of the old local reduction works that have been idle are expected to resume at an early date. Several of the new mills will also commence to treat ore in June, which will largely augment the yield of the district. It is reported that the Economic plant of the Woods Investment Company will soon pass into other hands and be operated to its full capacity. During the past month the plant has not been receiving ore for treatment. The mine operators confidently anticipate a larger increase in the output, although the average grade of the ore now being mined is lower than for past years.

Little hammer-drills are becoming very popular in the Cripple Creek district. Not only among lessees and for stoping narrow veins, but in mines operated by companies, they are supplanting the piston-drills to a large extent; mine managers who have had experience with the small drills claim that they will eventually supercede piston-drills for stoping. The dust caused by hollow steel and rosette bits has been almost eliminated by the use of solid steel for all back holes, so that now the little drills, properly constructed and operated, do not make as much dust as the piston type of drill in dry holes. There are several kinds of little hammer-drills in use in the district, and most of them will drill more linear feet of holes in any kind of rock than the 2 ft. 4 in. piston-drills, so that they fully make up in footage for what is sacrificed in diameter of hole.

The Shafter mine of Clear Creek county, which is credited with a production of about $1,000,000, has been developed at 300 ft. below the stoped ground by a lateral from the Central tunnel. At this depth an orebody, supposed to be a continuation of the surface shoot, has been uncovered over four feet in width, said to carry over three ounces of gold per ton.—— The Little Mattie group of mines, which has been operated under bond and lease for the past five years, has been transferred to the Little Mattie Mining, Milling & Power Company, of Idaho Springs. This group consists of 20 mining claims located on Chicago mountain.—— Recent development from the Headlight shaft of the American Sisters group of mines on Silver Creek, near Lawson, also in Clear Creek county, has disclosed two feet of ore valued at from $60 to $100 per ton. The mine is credited with a total production of $2,000,000, and has a dump estimated to contain half a million. A power plant for this property is being installed on Clear creek, to furnish power for machine-drills and a concentrator which is planned to treat the dump ore.

The unusual activity in Clear Creek county is spreading to Gilpin, and particularly in the northern part of the county, which is tapped by the Moffat road; old mines are being cleaned out and prospected, and new ones opened up. The old Perigo mine is being operated on the lease system and producing more ore than for a number of years past. The Bobtail mine of Central City is credited with a strike of ore on the 13th level, seven feet wide, assaying $75 per ton.

The Denver Chamber of Commerce is receiving numerous suggestions from disinterested (?) parties, as to "where a new mining camp may be found." In the majority of instances, a well-known and long-mined section is mentioned. The intention of the promoters of the 'new camp' idea is evidently to 'work over' old ground. It would be well to test some places where the existence of valuable minerals is not known. Why not send a geologist and an assayer, with portable outfit, at the head of each party?

TORONTO, May 28.

The members of the Ontario Legislature leave Toronto tonight on a four days' trip to the Cobalt mining camp and the mineral region to the north of it, as far as the rails are laid on the Temiskaming & Northern Ontario Railroad. Interest in the Cobalt region is kept up by continual reports of new strikes and discoveries, though latterly these have been mainly in connection with working mines. Prospecting for new locations in the Cobalt region proper is not nearly so active as last season, owing to so much of the territory being taken up, but the rush to the area farther north continues. The Temiskaming Mining Co., who are trenching a property known as the Dagle location near Cross Lake, have struck a silver-cobalt vein eight inches wide at a depth of five feet, a sample of which was found to assay 4,000 oz. per ton. This strike indicates that the Cross Lake formation extends considerably farther to the south than was known. Another strike on a new property was made last week by the McCormack Bros., Lawrence O'Connor and Henry Moore, known as the Sudbury quartette, who have been following up a small vein on Giroux lake. The vein was found to widen considerably, becoming rich in silver and cobalt. A large nugget of native silver was also found. Mat Murphy, well known in Montreal sporting circles, has sold the south half of Devil's Rock, a point on the shore of Lake Temiskaming a few miles east of Cobalt town, to a Montreal syndicate for about $60,000. It has two eight-inch calcite veins assaying high in silver, with cobalt. Shipments of ore have fallen off of late, as several of the producing mines are storing their output until the Hamilton smelter is in operation.

Much activity prevails in the Boston Creek copper district, some 60 miles to the north of Cobalt, which is overrun by prospectors. The Herron Bros. of New Liskeard, who have taken up 80 acres, have a good vein, and outcrop samples give high assays. Capt. Dan Mosher, a noted prospector of Rainy River, has started on an expedition to Hudson bay in the interest of eastern capitalists. Geo. R. Mickle, lecturer in the Toronto School of Practical Science, has been appointed Provincial Inspector of mining claims under the new mining act. He has his work cut out for him, as a considerable number of the claims under which large areas in the Cobalt camp are held, are of a very dubious character.

The Canadian Department of the Interior is following up the experiments recently made in the smelting of iron ore by the electric process, by ordering an examination as to the extent and value of the iron ore deposits. This step has been undertaken on the recommendation of Dr. Eugene Haanel, Superintendent of Mines. Ever since the successful result of the smelting tests there have been numerous applications from all parts for information as to the iron-ore beds and the possibilities of their development for electric-smelting purposes. Three parties will be put in the field this season to conduct the investigation. One will work in Western Ontario and will be in charge of Mr. Shele; Quebec Province and Eastern Ontario are assigned to Fritz Cickel, while Prof. Woodman will conduct the investigations in Nova Scotia. Magnetic surveys will be made and samples secured for analysis. In addition, the examination will include the water-powers in the neighborhood of the deposits.

MINING SUMMARY

ALASKA.

A rich strike has been made on Holyoke creek, on the tundra just north of Nome within a stone's throw of the Portland bench. The mine is owned by Denhart, Bard and Nixon, two of whom, it is claimed, took out $37,000 in one day. When bedrock was struck, one portion of it was found covered nearly an inch thick with gold. All told, the winter clean-up on the Denhart, Bard, and Nixon claims totals a million dollars. The report of the strike has caused great excitement in the Seward peninsula. It is claimed the new Holyoke creek strike is richer than the Portland bench, and that the tundra around Nome will receive a great share of attention during the coming summer.——C. G. Hubbard of Seattle, and one of the owners of large copper properties in Copper River country, states that the Guggenheims have been trying to purchase their property, but all offers have been refused and it will be operated as an independent property. The thing that will make the Copper River district a big copper-producing region, he says, is the advent of a railroad.

ARIZONA.

COCHISE COUNTY.

A short distance south of Paradise the Oklahoma claim is being opened by S. Gallen and P. B. Warnekros of Tombstone. A tunnel is being driven on a contact of limestone and diorite. Soon after the tunnel was started, copper sulphide appeared and still continues. This vein is 18 in. wide. On one side of it is a soft formation, containing iron and possibly gold. In the soft ground there is also copper. Some of the richest sulphide runs 40% copper, though most of the ore is of a lower grade. Other work on this group includes a tunnel 50 ft., a shaft 15 ft. and several open-cuts. Near the tunnel, there is a spring, the water of which is so impregnated with copper that it leaves a copper stain on the rocks over which it runs.

At the Douglas smelter, of the Calumet & Arizona, the management has under consideration the installation of new reverberatory furnaces, and plans are being prepared for their installation. These will be the first of their type to be used at the Calumet & Arizona. The silica quarries have closed, this flux being replaced by the silicious ore from Globe. For some time the Copper Queen Co. has been experimenting with a view to arriving at a practicable method of recovering the copper which has heretofore been carried away in solution in the waste water from the mines. A small experimental plant was put in, and the results proving satisfactory, the company is now erecting a large plant having approximately 50 times the capacity of the one in use heretofore. The system consists of a series of vats in which are deposited old scrap iron. The waste water is turned into these vats, the copper being precipitated by the iron. The new plant will treat the water from the Holbrook and Czar shafts. After leaving the vats, which are near the Czar shaft, the water will be conducted by flume to a tank constructed by the city, and will afterward be used for sprinkling the streets of Bisbee and Naco road.

YAVAPAI COUNTY.

The Congress management has run a 1,000-ft. drift connecting shafts No. 4 and 5 at a depth of 1,000 ft., in which they have developed strong shoots of sulphide ore in new territory.

It is reported that a discovery of lead-silver ore has been made by Teller W. Daly, of Wenden. The ore runs 58 to 60% lead, 700 oz. silver, and $37 gold per ton. The veins occur at contact of a diorite dike and limestone. The discovery was made near Wenden.——J. E. Kelly, of Thumb Butte district, west of Prescott, is said to have netted $102 per ton on a shipment of ore from his properties in that district, sent to the Humboldt smelter.——Litigation in connection with the affairs of the Crown King Mines Co. of New York, at Crown King, has been settled, and operations at the mines are to be resumed upon a larger scale. New York capitalists have agreed to buy out the faction which has heretofore prevented the company from carrying out all its plans, and sufficient money has been put up to liquidate outstanding claims. The company recently installed a concentrating plant of large capacity to treat the 60,000 tons of tailing which have accumulated. The electro-magnetic separators have been rearranged and now give satisfaction. Work on the mine will be centered on the working tunnel to cross-cut many of the veins at depth.

CALIFORNIA.

AMADOR COUNTY.

The Wildman mill has been started up and rock of good grade is being crushed. A large orebody has been partly developed on the 1,400 level, south, in addition to ore opened in other parts of the mine.

The Gold Top gravel mine at Pine Grove, commonly known as the Wheeler claim, is idle owing to the shutting off of the water supply.——Under the management of Mr. Farwell, the Jose Gulch mine is being put in condition for work. A number of men are cleaning the old Horn ditch, which will take a couple of weeks more to finish. The mill is also being put in shape. C. A. Rice of Mokelumne Hill will have charge of the mill.

BUTTE COUNTY.

Recent heavy rains in the pocket mining district of this county have sluiced out coarse gold in a number of places, and pocket hunters have been more than usually fortunate in consequence, particularly near Rackerby, on the line between Butte and Yuba counties. Quartz mining is also active around Rackerby. A fine vein is being developed on the Rogers ranch, half a mile west of the postoffice.

COLUSA COUNTY.

The Quarrymen's union at Sites went out on strike on June 1. The men are employed by the McGilvray Stone Co. and the Colusa Stone Co. About 35 men are out and the quarries are shut down. The difficulty is over the number of working hours per day, and the wage scale.

EL DORADO COUNTY.

Grading has begun for a 10-stamp mill on the Vivian mine near Greenwood. It is reported that work will soon be resumed in the shaft in the Hidden Treasure.—— Chlorination works are being erected on the Standard Unit mine in Coloma canyon below Greenwood, to treat auriferous sulphide.—— Drifting and cross-cutting is about to begin on the Rosencranz mine, where they are down 520 ft.——The Union mine, four miles south of Diamond Springs, is running with 30 men, and 20 stamps have been dropping at this mine during the past month. D. Humbert is now managing owner.—— Hugh McDougal and N. Behrns have given up their lease of the Bacchi-Collins mine near the Esperanza. John Breen and L. Beck have taken their place and are unwatering the shaft preparatory to doing development work.—— Silas Granger and S. Gray, while sinking on an ore-shoot on the Davidson place near Shingle Springs last week, took out a $3,000 pocket. Eleven pounds of ore, almost entirely gold, were taken out the first day, and $780 worth was found the next day, with more in sight.

Thirty men—splitters, trimmers and blockmakers—are out on strike at the Eureka slate-quarry near Placerville. Some time ago they demanded a raise from $3 to $3.50 per day, and a compromise of $3.25 was offered by the management. This was declined and the men quit work on Thursday of last week, and are still out.

SANTA BARBARA COUNTY.

The discovery of lithographic stone of good quality is reported in Loma Blanca district, 25 miles northeast of Santa Barbara. The company organized to exploit this find owns 800 acres of patented land.

SAN BERNARDINO COUNTY.

The engine and pump to be used in testing placer grounds of the Klinefelter wash, 25 miles northwest of Needles, are being installed.——On the property of the Siam Mining Co., situated near Siam siding, a water station on the Santa Fe railway 65 miles west of Needles, work is being prosecuted day and night. A shaft has been sunk, and two levels run, consisting of 600 ft. of drifts and cross-cuts. Recent development has disclosed free-milling quartz in the upper level running $100 per ton gold, while in the lower level copper ore assaying $90 to $100 gold, with 20% copper has been cut. P. H. McDermott is superintendent.

George Wilson, assistant manager of the Quartette properties at Searchlight, Nevada, has taken under bond a group of copper claims near Cima, in this county. In the district in which the copper claims are situated the principal operating concern is the Standard Mining Co., which is a steady shipper of gold, silver and copper ore. There is a large percentage of iron in the ore, for which the smelters pay a premium. A. B. Hall is foreman of the new mines. Three shafts will be sunk and hoists installed. The property is near the Salt Lake railroad, just south of Nipton.

SISKIYOU COUNTY.

The board of directors of the Siskiyou County Agricultural Society, at a meeting last week, bonded the race-track grounds at Yreka, to John O. Harrison for $7,000, of which $500 was paid, the remainder being payable in two equal payments, in one and two years. There are about 100 acres in this tract. It adjoins the Blue Gravel mine, and it is believed the ancient river channel from which the gold is obtained extends west under the race-tracks. As it is 110 ft. to bedrock, prospecting will be expensive.

A discovery has been made in the lower Salmon River district by Roy Wilson. The vein is from 30 to 60 ft. in width and can be traced two miles. A number of claims have been staked by Wilson, Murray, McLain, McKinzie and others, who have organized a company to develop the property. It is situated in a rough district of the Salmon, and they are now cutting trails and developing the new find. A number of samples taken from the vein where the ore crops out, show gold and copper. Parties from Eureka have bonded two of the claims and have started work. In the same neighborhood the Bennett brothers and others have located claims on Nordheim creek, upon a continuation of the same vein.

Judge Beard has rendered a decision in the Lanky Bob mining suit in favor of G. V. Gray, defendant, vs. C. A. Mitchell and G. G. Skillen, plaintiffs. The Lanky Bob mine is situated in Liberty mining district, in this county. G. G. Skillen was owner of the mine, and bonded the property to C. A. Mitchell for $10,000, of which $5,000 was to be paid in 90 days from date of agreement. Before the expiration of the bond, Skillen sold the mine to G. V. Gray for $12,000, a payment of $6,000 being made in cash. Then Mitchell commenced suit for possession of the mine, but as he had paid no money to bind the bargain, the case was decided in favor of G. V. Gray, who has taken possession of the mine. It is reported that Mitchell will appeal the case.

The Dannenbrink Bros.' quartz mine, on Knownothing creek, head waters of Salmon river, near the Trinity border, has been yielding handsomely of late. It has a quartz-mill and other modern improvements. Work is progressing at the Carlock & Morrison mine in Quartz valley.—— A number of quartz claims have been located in Sec. 30, T 47, R 4 W, where good copper prospects have been found. This is a new district on Klamath river in the Bogus district, where no mining has been done heretofore.—— A rich strike is reported in the Dismal Swamp mine, owned by Jeter & Frakes. The ore assays $70 to $215 per ton and is two feet wide. W. A. Hutton and Albert Spaulding have discovered a ledge in the Elliott Creek district which assays $130 per ton. This find is a new one. The rock in which the ore occurs is black quartzite which crops from 100 to 200 ft. in width. It is situated six miles from Joe Bar on Dutch creek.—— Nathan Durkee, superintendent of the Shaft Rock mine, near Yreka, intends to buy a 20-stamp mill and other machinery for that mine. The wagon road from Gottville to the mine, four miles up Empire creek, is completed, with the exception of two bridges across the creek, and they are in process of construction. Workmen are driving a tunnel on a level with the creek-bed, where the ledge is 12 ft. wide on the surface and carries $12 per ton.

SHASTA COUNTY.

The Bullychoop Mining Co. has appointed Sidney Smith general manager and H. C. Anchor superintendent of the Bullychoop mines.

TUOLUMNE COUNTY.

At the Soulsby mine the Bagdad-Chase Co. are still sinking the Pennsylvania shaft, where the 600 ft. station is about to be cut. At the Davidson shaft of this mine, the company is still unwatering the workings. The water has been lowered 175 ft. The head-frame and hoist are completed and everything is working smoothly.

COLORADO.

BOULDER COUNTY.

(Special Correspondence).—The Isabell Mining Co., operating on Caribou hill adjoining the old Caribou mine, has a shaft down 200 ft. with drifts both east and west. They recently encountered a body of ore assaying $200 per ton. In the east drift they expect to tap the Jay vein, which shows good ore in the upper workings, samples running from $300 to $600 per ton silver. J. R. Elgan, of Denver, is manager.

Caribou, June 1.

CLEAR CREEK COUNTY.

Four teams are hauling ore from the Stevens mill at Silver Plume and two cars of iron concentrate and 40 tons of lead have been shipped. The road from Graymont to the mine is in bad condition, but is improving, as the snow is going off. A large number of men are employed. Development is being carried on, including sinking the shaft on a good vein of ore.——B. J. O'Connell made a shipment of 11 tons of lead and 35 tons of zinc concentrate as the result of a run in the Mendota mill on ore from his leases on the Frostburg vein. Machine-drills are now used.——A large force is putting in the foundation for the lower terminal, and digging holes for the towers of the aerial tramway that is being erected for the Colorado Mines & Aerial Tramway Co. to carry passengers to the top of Leavenworth mountain, and it is expected to have it in operation in about a month.——A good vein of ore is showing in the shaft of the Smuggler, which is being sunk by the Main Gulch Co. There is about a foot of lead-zinc material and a smaller amount of high-grade ore.——The Terrible mill

is running steadily and the working force is being increased. Several machine-drills have been put to work in the mine in order to keep the mill supplied.

LAKE COUNTY.

The mines of Leadville are paying $400,000 per month, in wages, with an open shop. The last fight made by organized labor ended so disastrously for the union, that it resulted in a chance for any good man to get work. A man must present himself to the Mine Managers' Association, prove he is a capable miner, and get a card, when he becomes eligible for work; he cannot get work without this card.

OURAY COUNTY.

There is said to be in Ouray district a scarcity of single and double-hand hammersmen, a class of miners that has gradually been growing less in the San Juan country since the introduction of machine-drills. Machine men and helpers now receive $4 and $4.50 per eight-hour shift. Single and double-hand hammersmen, however, cannot be entirely dispensed with, and the latter class of laborer is now in demand in the district. ——A telegram has been received at Ouray ordering the resumption of work in the Treasury Tunnel Mines Co. adit, at Red Mountain. The order also includes the extension of the drifts at the 300-ft. level in the raise on the Handicap vein, where ten feet of ore has been cut. The mill will resume in August, giving work to 35 men. The Treasury's main working tunnel is in 5,530 ft. and is to be driven an additional 5,000 ft. when it will have intersected the Corn Cob, Vagabond, Schemer, Tomboy, Argentine, Cimarron, and Columbia veins. The Tomboy vein will be cut 1,030 ft. below the bottom of the deepest shaft, which is down 600 ft. The strike of high-grade ore at the Mineral Farm, near Ouray, has been the incentive for renewed activity among the mines and prospects of the lime belt adjoining Ouray. Among those to resume work is the Merchant's Mining Co. on the group to the north of the Mineral Farm, where considerable development has been done in recent years. Some ore is being extracted in driving along the contact, but work is hindered on account of water.

SUMMIT COUNTY.

The $90,000 dredge of the Reliance Gold Dredging Co. opened the placer season in this county three weeks ago, and is running day and night on good gravel.

TELLER COUNTY.

The Doctor-Jack Pot shipped 15 cars in May. Smith & Altman, who have about one-half the Jack Pot property under lease, shipped the most of the ore which came from three shafts, the Jack Pot, Elizabeth Cooper and Davenport. Smith & Altman have the south one-half of the Jack Pot claim and all of the Cooper. Altman alone is now getting good ore from the Chief claim. There are 27 sets of lessees now operating on the Doctor-Jack Pot property, and nearly all are in ore. The Gregory lease, which in 1905 produced $300,000 for Lew Hayden, the lessee, expires in August, when it will be worked by the company.

The strike of a body of two-ounce ore is reported on the 400-ft. level of the Mary Ann claim adjoining the Jo Dandy on Raven hill. This claim had not been operated for several years until recently, when it was leased to an outfit which did considerable development work with the result that ore was soon encountered.

IDAHO.

CUSTER COUNTY.

A gold quartz strike is reported from the Daisy mine of the Sunbeam Co., near Challis. C. E. Cable is general manager. They worked on low-grade stuff last season—$2 to $5—while exploring for better ore. During the past winter a cross-cut was started in the porphyry and a vein that did not show on the surface was cut. It is three to six feet wide and rich in gold. A raise has been put up 60 ft. and drifts run on the vein at the tunnel level. The ore assays from $50 to $100 per ton, and some of it will be sacked. A run was made, as a test, and $8,000 taken out of medium-grade ore. The mill is to be repaired and put in operation as soon as some needed machinery arrives. This mine is on the north side of what is known as Bismarck mountain, and is separated from Estes mountain by Jordan creek, and five miles from Custer and directly on the wagon road to Loon creek.

SHOSHONE COUNTY.

Stanly A. Easton, manager of the Bunker Hill & Sullivan Co., states that the savings of the company by its experimental tailing plant, recently installed, are of sufficient magnitude to justify the company in putting in a large plant with which to re-work its entire dump, which contains 1,000,000 tons of tailing from the concentrator—the accumulation of nearly 20 years. The tailing assays from $2.50 to $4.50 per ton silver and lead, most of which can be saved by the process with which the company has been experimenting since early last spring.

MICHIGAN.

HOUGHTON COUNTY.

The Allouez and Centennial mines both made good records during May, showing an increase over the output of former months. The Allouez during May yielded 514,630 lb. copper and the Centennial 310,000 lb. Allouez during the month made no advance in its No. 2 main shaft on account of the volume of water there. The shaft is 80 ft. deep, and it is thought that a few feet additional will reach solid rock. Drain shafts close by have encountered the rock at about the same depth as that now attained in the No. 2 main shaft.

Mining in the Tamarack will be resumed in a few days in the three shifts which were closed on account of the fire. The conflagration which started in No. 2 shaft more than five months ago, has been extinguished. It is expected that work will be resumed in No. 5 shaft first, as that is a downcast shaft, and there is less danger from gas in its workings. Men went underground in No. 5 shaft this week and found little gas. There is a scarcity of experienced miners in the Lake Superior copper district, owing to the great activity at all the mines. Many of the men who worked at the Tamarack have obtained work elsewhere. The prosperity caused by the present price of the metal is evidenced on every hand. The construction of the Keweenaw Central railway requires a large force, and the paving of the streets, laying of cement sidewalks, and exceptionally large amount of building work under way in various towns, gives employment to several thousand men. The Calumet & Hecla Mining Co., which recently obtained control of the Nonesuch mine in the Porcupine Mountain copper range in Ontonagon county, will begin extensive diamond-drill explorations on the property. An excellent copper showing has been made on the Keweenaw Copper Co.'s property, in Keweenaw county, in the last few days. One of the old shafts at the Medora mine was unwatered and cleaned out, and in the bottom good ore was found. This shaft was sunk to a depth of 50 ft. probably 40 years ago, in what is known as the Medora amygdaloid bed. The identity of this bed, however, is uncertain.

MARQUETTE COUNTY.

Orders have been placed for the necessary timbers and machinery for the mill to be erected by the Ishpeming Gold Mines Co. at the Michigan gold mine, northwest of Ishpeming. Work on the foundation for the plant will start in a few days. The structure will be erected near the main shaft, with which it will be connected by tramway. The plant will have a capacity of 10 tons daily, crushing through an 80 screen. After leaving the plates the tailing will pass through a process for the recovery of other mineral, finally going to a tube mill, where the quartz will be ground into silica powder of 250 mesh. The silica powder it is said will sell for $18 per ton. Mining operations may not start until the mill is completed, as there is ore enough on the surface to supply the mill for six months. The mine is equipped with hoisting and other machinery.

MONTANA.

SILVER BOW COUNTY.

It cost the North Butte Co., of Butte, 4.38c. per lb to produce its copper in April. By August, when the new hoist is working, the company will be hoisting 1,500 tons of eight per cent ore daily.

NEVADA.

CHURCHILL COUNTY.

Among the prominent mines in Fairview district are the Nevada Hills, Wingfield group, Boulder group, Ida M. group, Harnan group, and Lena, each of which has several veins. The Nevada Hills has the best showing at present. The ores are chlorides and sulphides, silver predominating. One shipment has been made from the Nevada Hills and another shipment is sacked and ready. The mineral zone covers an area five miles square, every inch of which is located. About 100 men are working in and about the mines. There are many idle men in camp, and it is not advisable for miners and laboring men to go to Fairview for some time, in search of work. Supplies are hard to get, the growth of the camp exceeding hauling facilities, but fairly good board can be had for $10 per week. Water costs from $2.50 to $3 per barrel; wood, $20 per cord. Miners' wages are $4.50 and $5 per day. A strike has been made on the Wingfield, and another in a cross-cut on the Harnan. Numerous other reported strikes have in almost every instance been verified.

ESMERALDA COUNTY.

Good strikes are reported from near Alkali Springs, seventeen miles northwest of Goldfield. For two days last week the stream of gold seekers poured from Goldfield into the new district. The ore taken out resembles that of Tonopah. The samples brought from this district assayed $77. Picked samples went $5,000. The district is eight miles long by three miles wide. It is five miles from the railroad, with wood and water near.

LINCOLN COUNTY

(Special Correspondence).—An innovation in mining company organization will be introduced into Searchlight district, by a new company organizing under the title of the Searchlight Consolidated Mines, Ltd., with a capitalization of 5,000,000 shares, par value $1, of which 4,000,000 shares have been placed in the treasury. The company has acquired 20 claims in the northern end of the district, and is preparing for extensive development. Two gasoline hoists 25 and 10 h.p., respectively, will be installed. Ogilby Woods is superintendent, and will have charge of the company's entire holdings.——According to a statement of Mr. Hurt, the Golconda Mines Co. is about to begin operations on their property which joins the Gold Dike on the north and east.——The officials of the Cyrus Noble Mining Co. of Redlands, Cal., have paid a visit to Searchlight, the company's main office, to look after their interests, both in this district and in El Dorado canyon. As a result of their visit the Gold Dike Co., controlled by them, will start in with renewed energy.

Summit Springs and Sunrise, the districts east of town, are unusually active, and reports from Summit Springs are to the effect that ore running from $10 to $75 is being blocked out on the main property of this section. Numerous groups are being incorporated and put in condition for development. At Sunrise several groups have been sold to Minnesota and Pittsburg capitalists, and the first rush to this district four months ago when hundreds of claims were staked, is resulting in development, which in nearly every instance, is meeting with better results than was anticipated. Should this excellent showing continue with depth Searchlight will expand into a larger and more prosperous district. A large number of freight teams, loaded with supplies, are passing through Searchlight en route to El Dorado canyon and Nob Hill, and by the time the railroad is completed into Searchlight the El Dorado and Nob Hill district will have enough ore of a shipping grade blocked out to supply the new railroad with a large amount of return freight, as all shipping ore will be held until the completion of the railroad.

Searchlight, May 29.

NYE COUNTY.

Miners' wages in Bullfrog district are stated to be for eight-hour shift, as follows: Foreman, $8, shift boss $6.50, sinking $5, surface work $4.50, drifting $4.50. Underground work in Butte $3.50; Tonopah and Goldfield $4.

OREGON.

BAKER COUNTY.

(Special Correspondence).—All the mining camps surrounding Baker City are active, but the greatest interest is in the development of the copper belt to the northeast. The orebodies suffer nothing in comparison with other copper sections of the country. At the Indiana mine, near Medical Springs, which is in charge of J. W. Messner, the average is eight per cent copper, and from $5 to $8 per ton gold and silver. Most of the available ground, between the Indiana mine and the North American property, at Burkemont, has been staked, and many new prospects will be opened along this belt during the present year. At Burkemont, which is near the geographical center of the copper range, D. W. C. Nelson, manager, is down 300 ft. with a double-compartment shaft, on the North American, and has passed through 85 ft. of native copper ore. For souvenirs of this period in the history of the copper development of this region he is having struck from the first copper produced, medallions, about the size of a silver dollar, with an engraving on one side of the North American shaft-house, and on the other, an inscription with date of issue. On Goose creek, in the property of C. C. Cox, the discovery of bornite is announced. The development of this property has just commenced.

Above the copper belt and higher on the range, near the foot of the Eagle mountains, is the Cornucopia camp, in which a number of mines are located around an old gold producer, heretofore owned by John E. Searles of New York. This is the Union-Companion, which is reported to have recently passed under the control of the Guggenheims. The force has been increased to 100 men, and the property is outputting about $50,000 per month. Adjoining the Cornucopia, the Mayflower, G. W. Boggs, manager, is completing a cyanide plant, and the reduction of ore from this property will begin early in June. The ore-bins are full, and large reserves are being blocked out in the mine. Not far from the Mayflower, the Queen of the West Co. is preparing ground for the erection of a 10-stamp mill, and this property is

expected within a short time to join the list of producers in Cornucopia camp.

To the west of Baker City, and lying above Powder River valley, at the base of the Blue Mountain range, Edward I. Field, of the United Elkhorn mines, is shipping concentrate steadily from the Baisley-Elkhorn. Since this property passed into the hands of F. M. Hayes of Philadelphia two years ago, development has been proceeding, both underground and on the surface. An electric power-plant was first installed near the foot of the mountain on which this mine is situated, and a heavy expense was eliminated thereby, in transporting fuel up to the workings, which are 3,000 ft. above the valley. Other features were introduced, involving a large initial outlay, and an adit is now being driven to cut the orebodies in this property at a depth of 2,000 ft. One hundred men are employed at this mine, and it is reported that the Salt Lake smelter has contracted for the entire output of ore from the United Elkhorn, and that the concentrate is now being shipped there. Over the summit from the Elkhorn, the Highland property, which recently emerged from a siege of litigation, has resumed operations on a large lode. The new concentrating plant on this property has a capacity of 50 tons daily.

At Timber Canyon, Frank J. Davey, manager, is running ore out of a new tunnel on the property of the Timber Canyon Mines Co., and preparation is making for the erection of a mill at this mine about the middle of July. In the Quartzburg district, the Standard mine is steadily producing, as is also the Equity Mining Co., together with the Copperopolis. Aside from these, a number of promising prospects are being opened.

There is hardly a stream or dry gulch in Baker county that has not yielded, or would yield, placer gold, if water were available. The deep snows of the past winter have been advantageous to alluvial mining, and many new diggings have been opened. Several companies are operating at Stice's gulch, and its tributaries, and all are getting good returns. Fred Eppinger, manager of a local organization known as the Merchant's Co., has just come in from Cow creek with a fruit-jar full of gold estimated at $4,000, the result of a short run through the sluice boxes on the property of his company. Several of the nuggets will weigh 5 oz., and many of them will run from $5 to $20. All the gold is coarse and easy to save. In ordinary years this property yields about $20,000, but the increased supply of water this season will enable the owners to make a longer run, with the expectation of doubling that amount. In the old Sparta camp, that has produced millions in placer gold, W. F. Talmage is at the head of a company which has a ditch from the Eagle river that will afford a constant water supply in the development of new placer ground. He has completed a bed-rock flume and will work a large force during the present summer, in Saw Mill gulch.

Baker City, June 5.

SOUTH DAKOTA.

LAWRENCE COUNTY.

From the 165-ft. level of the Homestake South Extension driving east and west is continued with day and night shifts. This level is to be explored before going deeper. This company is operating 2,000 ft. southeast of the Ellison hoist of the Homestake on a system of mineralized veins.—— On the Mark Hanna group, at the head of Two Bit gulch, four miles southeast of Deadwood, free gold ore has been found 400 ft. below the surface in a vertical vein. The ground is owned by Nick Treweek, State Mine Inspector, Mrs. Joseph Treweek, of Lead, and Thos. Thomas, of Two Bit.

The Kildonan mill, at Pluma, situated about midway between Deadwood and Lead, is being put in shape for resumption of treatment of Horseshoe ore. The changes contemplated are so numerous that the mill will practically be rebuilt. Arrangements will be made to treat a large volume of slime. Electric power will be utilized.——Rolls to crush dry are being put in by the Gilt Edge-Maid Co., replacing Chilean mills.—— The miners of Bald Mountain district, aided by merchants of Deadwood, are considering the installation of an aerial tramway to connect the mines of the Bald Mountain district with the reduction works at Deadwood. The mine-owners and ore-shippers claim the railroad charges are too high, and that the proposed tramway will prove a good investment.

PENNINGTON COUNTY.

At the Mariposa mine near Mystic, development is being pushed. Compressor and machine-drills were recently installed. The company is driving a tunnel to develop the veins at 400 ft. depth. There is a good surface showing on the top of the hill.—— Rich ore was found last week at the Sullivan mine, five miles southwest of Rochford on Castle creek. The ore is white quartz, rich in gold. The Sullivan mine has frequently produced similar ore in the past. Owners of the neighboring property are bestirring themselves to locate the extension of the vein.

TEXAS.

BREWSTER COUNTY.

Two new quicksilver finds in Brewster county have caused an impetus to the mining industry there. One of these veins is several miles east of the Lindsey & Dallas property and is now being worked, investigations with diamond drills having discovered a large body of ore. The other field is a few miles northeast of the Cigar Springs mountain. The two new fields are a hundred miles apart and are taken as indicative of the wide scope of country available for development of quicksilver. The opening of the coalfields in the Big Bend of the Rio Grande, contiguous to the quicksilver mines, solves the fuel problem in the district, and development is making rapid progress.

UTAH.

SAN JUAN COUNTY.

Heretofore the mines in La Sal district have been too far from railroads, and separated from them by such poor roads that the owners of property have done little development. Within the present year there has been a movement in several localities to better the roads to shipping points, and within the next few weeks there will be better roads leading from the various points of the range. There is an influx of miners and investors into several regions along these mountains, and property owners are developing their claims. The chief interest has attached to the Beaver Basin district. Opposite the Beaver Basin, on the other side of the range, is Miners' Basin, in which a large property was recently sold. The new company is building a wagon road from Castleton to the head of Castle creek. At Gold Basin, at the southern end of the range, the Intermountain Co. expect to have their mill ready for operation by June 1. Up to the present they have been handicapped by snow. The Salt Valley copper properties, 15 miles from Thompson springs, are giving good results. The properties in Sinbad valley on the east slope of the La Sals, are getting busy. One company of Colorado capitalists intends to develop its properties, is building a mill and has secured many claims near the original group. They also are building a wagon road to Grand Junction.

SUMMIT COUNTY.

At the Daly-West mine, Park City, as a result of a refusal on the part of the miners to take oil-lamps into the mine, for the purpose of comparing their use with that of candles, all the men, with the exception of a few timbermen, are out, and insist that they will not return to work under present circumstances. The first trouble came a few days ago when the men who were about to go on shift refused to take lamps with them. Other shifts refused in the same manner, so there is practically no work being done in the mine, and as a result the mill force will have to be laid off, unless the trouble is settled. About 200 men are out. The miners claim that the lamps are unhealthful, dirty and inconvenient, and believe they are being imposed upon when asked to use them. They claim that they have given the lamps a fair trial and have found them unsatisfactory. Ernest Bamberger, manager, says that all he has asked from the men was a fair trial of the lamps, and this they had refused. For two or three shifts, a few of the miners had tried the lamps, and the shift-bosses gave favorable reports on their use during this time. Thursday evening, without giving any notice whatever, the men refused to go into the mine.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Pearl Consolidated Mining Co. shipped 17 carloads of ore up to May 22, being more than all that was shipped during April, and there were three additional cars ready. All of it came from the Lone Pine lower level and was sent to the B. C. Copper Co. at Greenwood, B. C. On account of changes being made at that company's smelter, no more ore will be shipped there until the alterations are finished. Carload samples are to be sent to Denver and other points to be tested for milling processes. There is a large quantity of low-grade ore in the Lone Pine, Pearl and Surprise claims, owned by the Pearl Co. The nearest approach to successful mill treatment of the ore of Republic camp was a modification of the cyanide process made in the Republic mill, which has been dismantled within the past 18 months. It was built at a cost of $350,000, but was not supported by the mine owners of the camp, and shut down when the orebody in the Republic mine pinched, after which only a little exploratory work was done below the mill-tunnel level. In the Lone Pine workings the cross-cut from the South drift is complete and the drift driven ahead, and there is now good ore in the face.

Republic, May 31.

(Special Correspondence).—During the week the Pearl Consolidated Mining Co. shipped ten carloads of ore from the Lone Pine workings.—From the Ben Hur mine shipments were about the same as for the previous week.—Ingham and Witcher, who for the past six months believed they had found a deposit of molybdenite on their ranch, on Cayuse mountain, Okanogan county, now realize that the mineral is stibnite. Samples run from 70.1 to 43.3% antimony. Eastern ore buyers have offered $2 per unit for the ore, and the railway offered transportation for $23 per ton.—The Q. S. Gold Mining and Smelting Co. continue to find ore of shipping grade in their tunnel and is figuring on driving another tunnel at the base of the mountain to cut the vein at a depth of 3,000 ft. A gravity tramway is to be constructed and a sawmill will be installed for cutting timbers for the mine and camp buildings. In case the lower tunnel should be driven a large compressor will be put in.—The Golden Chariot mine, situated five miles northwest of Oroville, an old camp on the Vancouver, Victoria & Eastern Railway, now under construction, was purchased two years ago by a syndicate of Spokane, Wash., Minnesota and Dakota people, and the Golden Chariot Mining and Smelting Co. incorporated. Last fall a vertical shaft was started and sunk 100 ft. At 30 ft. a pay shoot was cut, and drifts were driven north and south on the vein. Recently in the south drift a winze was sunk 25 ft. on ore that assays $25 to $40 per ton.—The Elone Mining Co. is operating three claims in the Methow Valley district, near Twisp, developing a 30-ft. vein. The ore assays $5 to $30 per ton, mostly gold.

Republic, May 22.

FREMONT COUNTY.

J. H. Lobell, head of the Belgo-American Drilling Co., owning extensive oil fields in Wyoming, has filed on 2,460 acres of placer land in the Oregon Butte country near Lander, and it is reported that gold has been discovered. A pumping system is to be installed to develop the placer fields.

OKANOGAN COUNTY.

(Special Correspondence).—In Myers Creek district the Mad River Mining Co. has developed an orebody assaying $40 to $65 gold and silver, with considerable zinc-blende. The main shaft is down 400 ft. and the company has a large quantity of ore ready to ship when the Vancouver, Victoria & Eastern Railway can transport it to the smelters.—The Sarauas adjoins the Mad River property and is preparing to increase the present force. A saw mill of 5,000 ft. daily capacity, and mining machinery, are to be installed.—The Wyandotte Mining Co. has struck galena, carrying silver.—The Bimetallic Co. expects to spend $10,000 this year on buildings, a new shaft, and development work.—The Olentangy Co. will install machinery at its shaft, which is now down 85 ft. A tunnel has been driven 50 ft. and ore has been developed in both which runs from $25 to $60 per ton gold and silver.—The Medallion Co. has a shaft down 100 ft. and is driving on gold and copper ore which runs $16 per ton.—The Ben Harrison Co. reports that it has ore enough on the dumps for a three years' run and will start up its mill June 15. This company is driving a 500-ft. tunnel.—About $100,000 has been spent on the Crystal Butte mine in tunnel and shaft work, and operations will be resumed as soon as transportation for the ore is available.—It is reported that the B. C. Copper Co., of Greenwood, B. C., will take up an $80,000 bond on the Grant mine and commence development. There are eleven claims in the group. The main workings show a body of ore 20 ft. wide, which runs $14 per ton. The ore is pyrrhotite, containing copper and gold.—On the Butcher Boy a streak of ore that assays $160 per ton gold has been followed from the surface, where it is five inches wide, to a depth of 80 ft., where it is 20 inches wide. The mine is under bond and the operator, having taken out enough to pay all expenses of the mine for six months past, will take up the bond and ship the ore. The shaft will be sunk to the 100-ft. level, and machinery will be placed on the mine.—John E. Boyd, general manager, and E. W. Beidler, superintendent of the Palmer Mountain Tunnel and Power Co. are in the East. Mr. Boyd went to Denver to purchase electric drills and examine machinery for a 300-ton mill. They will return shortly to the mine and the operations at the tunnel will be resumed. It is now in 4,000 ft. and has crossed 24 veins, the last at a depth of 1,390 ft. One of the veins is 30 ft. wide. Mr. Boyd told the writer that he figured that all the ore in sight will average about $10 per ton.

Chesaw, May 18.

CANADA.

BRITISH COLUMBIA.

Men are at work on the Big Copper mine, in Copper camp, four miles from the Mother Lode mine and eight miles from Greenwood. A deal has been made for the Big Copper, on an option and bond, the property

being taken by Boston capitalists, who have started development. W. T. Smith of Greenwood and J. C Haas of Spokane, took the bond for their principals. The Big Copper is owned by John Moran, S. W. Mc Michael of Toronto, and George B. McAulay estate. In the last few years several attempts have been made to secure the property, but up to this time none of them has been successful. Nearly 600 tons of Big Copper ore were shipped to the British Columbia Copper Co.'s smelter at Greenwood last winter, which returned nearly $14 per ton. As the mine is three miles or more from the Mother Lode spur of the Canadian Pacific railway the ore, up to the present has been hauled on wagons to that point for shipment to the smelter. The ore at the Big Copper is mined by glory-hole method. William Hanna is in charge.—High-grade copper ore has been struck on the Maple Leaf property on Franklin mountain. The orebody has been stripped for 80 ft. and the width is 15 ft. It is reported the samples assayed ran 16% copper. The Maple Leaf is one of a group of five claims owned by W. H. Young of Vancouver and the Fee Bros. of Grand Forks.—The total output of the Boundary mines and treatment at district smelters exceeds 500,000 tons for this year. The following figures are for the week ending May 26: To Granby smelter, Granby mines, 16,055 tons; to British Columbia Copper smelter, from Mother Lode, 4,128 tons; from Emma, 260 tons; to Dominion Copper Co.'s smelter, from Brooklyn-Stemwinder, 2,805 tons; from Rawhide, 462 tons; from Sunset, 792 tons; from Mountain Rose, 36 tons; to Nelson smelter, from Emma, 90 tons; total shipments for week, 24,628 tons; total shipments for year to date, 509,539 tons. The three district smelters treated this week: Granby smelter, 16,712 tons; British Columbia Copper smelter, 4,205 tons; Dominion Copper company smelter, 4,095 tons; total treatment for the week, 25,012 tons; total treatment for the year, 521,626 tons.

Following is the tonnage of ore shipped from and crushed at the Rossland mines for the week ending May 26: Centre Star, 2,880; Le Roi, 2,490; Le Roi No. 2, 450; Jumbo, 130; total, 5,950; total for year, 131,565. At Le Roi No. 2 the concentrator is in steady operation. Early the coming month another shipment of concentrate will be made. The smelter of the Consolidated Mining & Smelting Co. of Canada, Ltd., at Trail, received, besides ore from the Rossland mines, the following quantities: St. Eugene, 496 tons; Silver King, 69 tons; Snowstorm, 68 tons. The total received, 5,972 tons. The erection of the large copper furnace continues, and it should be in condition to be blown in in about a month.

The Glouster group of copper properties in Glouster camp have been bonded to the Dominion Copper Co By the terms of the bond development work will begin now and be kept going until the bond is lifted. Cash payments are to be made at stated intervals during the life of the bonds. The Glouster properties are owned by Thomas Newby, Lee Mercer and Howard Garnett. This group was bonded a few weeks ago by G. A. McLeod, who turned the bond over to the British Columbia Copper Co. and now the Dominion Co. has acquired the entire group. It is reported that the Diamond Hitch property, will be added to the list of working mines. The Diamond Hitch has a large showing of iron ore with copper. On the dump at this claim are several tons of iron ore which were taken from the workings. The Diamond Hitch lies on Pathfinder mountain, and is owned by residents of Grand Forks.

The output of the Boundary mines for the week ending June 2, was as follows: Granby mines, 15,756 tons; B. C. Copper Co. Mother Lode, at Deadwood, 2,201 tons; Dominion Copper Co. at Phoenix, 1,947 tons; Rawhide, at Phoenix, 396 tons; Sunset mine, at Deadwood, 759 tons; Mountain Rose, at Summit, 30 tons; Emma, at Summit, 264 tons; Sally, at West Fork, 25 tons; Butcher Boy, at West Fork, 9 tons; Providence, at Providence, 40 tons; Don Pedro, at Skylark, 20 tons. Total, 21,437 tons. The smelters during the week treated ore as follows: Granby Co., 17,177 tons; B. C. Copper Co., 2,473 tons; Dominion Copper Co., 3,132 tons. Total, 22,782 tons. The week's tonnage from the B. C. Copper Co.'s Mother Lode mine, as well as the amount treated at the smelter, is somewhat smaller than usual, owing to the preparations for blowing out the furnaces to permit extensive enlargements. For the month of May the tonnage of the Granby Consolidated will be smaller than usual, owing to a continuation of changes and improvements. When these are completed the output will be crowding the 80,000 ton mark, making 2,200,000 lb. copper monthly. The report is current that an option has been given on the B. C. mine in Summit camp which is owned by the B. C. Chartered Co. (Ltd). This property in the past has shipped 100,000 tons of copper ore. A spur of the Canadian Pacific railroad runs to the B. C., which has a full equipment of machinery.

Personals.

Walter Douglas is at Santa Barbara.

John B. Farish is in San Francisco.

Forbes Rickard is at Chihuahua, Mexico.

Charles Butters has returned from Chicago.

D. J. Sayer, of Denver, is on a visit to New York.

Edward H. Benjamin is examining mines in Idaho.

F. F. Sharpless is at Kamloops, British Columbia.

R. Gilman Brown has returned from British Columbia.

Carlos Cadmus, of Broad Run, Virginia, is at Havana, Cuba.

J. C. Ralston has an office at 464 Eleventh St., Oakland.

Chas. W. Abbott is at Minas de Alotepeque, Guatemala.

Clarence K. McCormick, of Salt Lake City, is at Paris, France.

Herbert T. Butcher has returned to England from Mexico.

Willard P. Hatch, of Goldfield, Nevada, is visiting at Oakland.

J. Power Hutchins is expected in San Francisco from New York.

Jas. W. Abbott was in Berkeley this week; he is now at Denver.

Lionel Lindsay is visiting the mining camps of Utah and Colorado.

W. R. Feldtman is on his way from London to Western Australia.

Wilbur E. Sanders has returned to Helena, Montana, from British Columbia.

Philip Argall has been elected president of the Colorado Scientific Society.

W. G. Swart, of Denver, visited Berkeley on his way from British Columbia.

David T. Day is at Portland, Oregon, attending to experiments on black sand.

E. W. Sebben has returned to Denver from the examination of mines in Arizona.

G. W. Borrowe is superintendent of the Sons of Gwalia mine, in Western Australia.

Richard B. Stanford is at Woodcliff, New Jersey; he returns shortly to Nicaragua.

J. H. Hartley, lately in the Terlingua quicksilver district, Texas, is now in Berkeley.

E. C. Engelhardt has been appointed superintendent of the Cooke City smelter, Montana.

H. C. Anchor has been appointed superintendent of the Bullychoop mine, in California.

Albert G. Kitchin is on his way from England to examine mines in Western Australia.

Chester Naramore, of the U. S. Geological Survey, has gone to Cripple Creek, from Denver.

A. A. Steel is associate professor of geology and mining in the University of Arkansas.

H. G. Murray is on his way from San Francisco to Japan, where he has an appointment.

C. W. McArthur is erecting the mill for the Gold Prince Co. at Animas Forks, Colorado.

William Magenau has been appointed manager of the National Rubber Company, in Durango, Mexico.

L. B. Davenport, recently superintendent of mines near Nashville, Cal., is now on a visit at Berkeley.

R. H. Goodwin, engineer of the British Guiana Consolidated Gold Mines, Ltd., has arrived in London.

Horace F. Evans has been visiting the Similkameen district and is now near Princeton, British Columbia.

James P. Colp has been appointed manager of the Arden Falls Mining Co. at Monumental Falls, California.

Sidney Smith has succeeded W. R. Beall as general manager of the Bullychoop copper mines in Shasta county, Cal.

A. T. Holman, superintendent of the Golden Cycle mine at Cripple Creek, is taking a vacation on the Atlantic coast.

John O. Harrison, who bought the race-track grounds near Yreka, Cal., for mining, is in charge of prospecting operations there.

F. C. Carstarphen has returned to Denver from Portland, Colo., where he has been the past six weeks for the Portland Cement Company.

Richard C. Shaw sailed from Boston on June 1 for Miramar, Costa Rica, where he will become general manager of the Montezuma mine.

Bert Peterson passed through San Francisco, on his way from New York to Mexico, where he has taken up El Rayo mine, in Chihuahua.

Edwin W. Mills has resigned as assistant superintendent of the Oriental Consolidated Mining Co., Chemulpo, Korea, to become superintendent of the Chiksan mines of Korea, which are being exploited by the Korean Exploration company of Kobe, Japan.

T. H. Oxnam has resigned his position as consulting engineer and general manager of the Palmarejo & Mexican Gold Fields, Ltd.; he is proceeding to England for a few months' rest.

George Hallett, of London, director of the Palmarejo & Mexican Gold Fields, Ltd., in Chihuahua, Mexico, has been spending a week with T. H. Oxnam, at Los Angeles, on his return from the mines in Mexico. He sails for London on June 21.

Obituary.

John B. Francis, who for many years has been superintendent of the Argonaut mine at Jackson, Cal., and identified with other California mines, died last week at Jackson. Mr. Francis was severely injured at the Argonaut mine several years ago in an over-winding accident, from the effects of which he never fully recovered.

Joseph C. Thomas, head mining captain of the Michigan mine, and one of the pioneer miners of the Lake Superior copper district, died at the North Michigan general hospital at Calumet, Mich., a few days ago. Captain Thomas was 66 years old and had been identified with the mining industry all his life.

Dividends.

On June 4 the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 106, of $180,000, making the total paid since January 1, 1906, $1,680,000, and total to date, $6,606,000.

Trade Treatises.

Mine and Quarry, is the title of the newest publication of the Sullivan Machinery Co. of Chicago, Ill. This interesting little magazine is to be issued regularly, its purpose being to give up-to-date information on the subject indicated in the title, and to familiarize its readers with Sullivan machinery. No. 1, Vol. 1, contains the following: Editorial, Rock Excavation on the Panama Canal, Method of Mining at an Illinois mine, Diamond Drilling, Power Extension of the Chicago Drainage Canal, Low Cost of Compressing Air for Drills, Cleaving Granite by Compressed Air, and Suggestions for Operating Rock Drills. The work is nicely illustrated.

Chalmers & Williams of Chicago, 1553 Railway Exchange Building, have issued a handsome catalogue (No. 1 Section F.) of their gold and silver mill machinery, and also concentrating devices. It is well illustrated with line cuts which could be used as working drawings.

The Allis-Chalmers Co. has issued Instruction Book No. 5006, giving full directions for setting up and operating the Gates ball mill which is finding constantly more extended use where fine grinding is necessary.

Rand Air and Gas Compressors are described and illustrated in Catalogue R 37, issued by the Ingersoll-Rand Co. of No. 11 Broadway, N. Y. The book is finely illustrated and contains much information of value to users of compressors.

The Robins Conveying Belt Co., Park Row Building, N. Y., have issued an interesting illustrated booklet, Bulletin No. 15, describing their belt conveyors and automatic-tripping devices for the transportation and distribution o fall kinds of mineral, at greatly reduced expense for handling.

Latest Market Reports.

Anglo-American Shares.
Cabled from London.

	May 31	June 7
	L s d	L s d
Camp Bird	1 2 9	1 4 6
El Oro	1 7 6	1 6 9
Esperanza	3 18 1½	3 17 6
Dolores	1 16 3	1 16 3
Oroville Dredging	0 18 1½	0 17 9
Stratton's Independence	0 4 0	0 5 0
Tomboy	1 7 6	1 6 3

(By courtesy of W. P. Bonbright & Co., New York.)

METAL PRICES.
By wire from New York.

	Average Prices for week ending May 31.	June 7.
Lake	$18.62@$18.87	$18.62@$18.87
Electrolytic	18.37@ 18.62	18.37@ 18.62
Casting	18.12@ 18.25	18.12@ 18.25
Lead	5.75	5.75
Spelter	5.96	6.03@ 6.05
Silver	0.67⅜	0.66⅛

Books Received.

Professional paper No. 49 of the United States Geological Survey treats of the geology and mineral resources of a part of the Cumberland Gap coal field of Kentucky.

Of the **Geologic Atlas** of the United States there have recently been received No. 132, Muscogee, Indian Territory; No. 133, Ebensburg, Penn., and No. 135, Nepesta, Colorado. The price of each of these is 25 cents.

The Geography and Geology of Alaska, is the title of Professional Paper No. 45 of the United States Geological Survey. This publication summarizes the existing knowledge of our most northerly territorial possession. It will be found useful to those interested in Alaska and its resources.

Gold Dredging. Supplement, 1906. By Captain C. C. Longridge, London. The Mining Journal. This is a supplement to the earlier volume, it being the intention to issue annual supplements until the additional material warrants a new edition of the book—which is an excellent plan. Capt. Longridge gives much useful information and despite the widespread character of dredging operations, he manages to keep in touch with them. Five hundred dredges are said to be at work in different parts of the world. To those in charge of them, this book should be of immediate value and also to the large number of people indirectly interested in dredging for gold.

The Directory of Agencies, Mines and Haciendas, of the Republic of Mexico, for 1905-06, has been received. The volume is what it purports to be,—an official directory, which includes the names of manufacturing firms, mining companies, etc., together with their addresses, and usually the names of managers or resident representatives or agents. It will be found indispensable to those having business interests in Mexico. The mining directory is arranged alphabetically by States. The work throughout is in Spanish and English, so that the reader may fully understand, if acquainted with either language. Sent by the Mining and Scientific Press to any address upon receipt of price $5 gold. American Book & Printing Co., 1 A San Francisco, Num. 12, Mexico City.

Commercial Paragraphs.

The Keuffel-Esser Co., of New York, has ordered from the Crocker Wheeler Co., of Ampere, N. J., one of their form L motors of 1 h.p., to drive their blue print machines.

The Penn Hardware Co., of Reading, Pa., are installing a 150-h.p. Koerting gas-engine to be run on producer gas; this engine is supplied by the De La Vergne Machine Co., New York.

The Utah Mining Machinery & Supply Co., J. E. Galigher, manager, of Salt Lake City, reports shipment of Callow traveling belt screens to South Africa, Australia and England; also Callow settling tanks to the Federal Mining Co., Wallace, Idaho, and Ohio Copper Co., Bingham, Utah.

A cyanide gold mill of 500-ton capacity is reported sold by **Fairbanks, Morse & Co.** The entire plant will be operated by Fairbanks-Morse direct-current dynamos and motors, driven by water-power, a 240-ft. head being available. The mill will be near Boulder, Colorado, and will be modern and complete in every way.

The laboratory of the firm of Simonds & King, at 417 Montgomery St., San Francisco, having been destroyed by the fire, in common with all others in the City except the Government laboratories at the Mint and Custom House, they have decided to discontinue the partnership, and will take up separate lines of work. All persons having claims against the firm are requested to send statements of account to 1311 Franklin St., Oakland, and all old customers indebted to the firm will confer a favor by remitting to the same address. Mr. King will continue the former assay and analytical business, including ore testing, etc., and has equipped his laboratory with a complete outfit for assaying, analyses, and ore testing, including laboratory-crushers and grinders run by power, thus insuring rapid and accurate work. His office and laboratory will be at 1311 Franklin St., Oakland. Mr. Simonds will engage in practice as a metallurgical engineer, and will confine his work entirely to ore-treatment, including ore-testing, the devising of methods of treatment and the design and supervision of ore-reduction plants. His office for the present will be at 2842 Hillegas Ave., Berkeley, California.

Temporary Addresses of San Francisco Firms and Professional Men.

ADAMS, W. J., 2205 Bush St., San Francisco.

ALLIS-CHALMERS CO., 906 Broadway, Oakland, and Atlas Bdg., 602 Mission St., San Francisco.

AMERICAN TOOL WORKS, 109-111 Mission St., San Francisco.

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BROWN, R. GILMAN, Stringer Warehouse, 2031 Sutter St., San Francisco.

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BUTTERS, CHAS., 4 Bacon Block, Oakland.

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CALIFORNIA PERF. SCREEN CO., 1300 Arch St., Berkeley.

CALIFORNIA HYD. ENG. & SUPPLY CO., 1169 Jefferson St., Oakland.

CHROME STEEL WORKS, 1736 Walnut St., Berkeley. Phone Berkeley 2790.

COMPRESSED AIR MACH. CO., 415 Fillmore St., San Francisco.

DENNISTON'S S. F. PLATING WORKS, 3454 21st St., San Francisco.

DEWEY, STRONG & CO., 10 Bacon Block, Oakland.

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ELECTRIC RAILWAY AND MANUFACTURING CO., 619 Howard St., San Francisco.

EVANS, GEORGE H., Regent St., Fairview Park, Oakland.

FAIRBANKS, MORSE & CO., 969 Broadway, Oakland.

FALKENAU ASSAYING CO., Polytechnic Business College, Cor. 12th and Harrison, Oakland.

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GWIN MINE DEVELOPMENT CO., 1801 Central Ave., Alameda.

JOSHUA HENDY MACHINE WORKS, Bay and Kearny St., San Francisco, and Room 41, 906 Broadway, Oakland.

HANKS, ABBOT A., 1104 Broadway, Oakland.

HARRON, RICKARD & McCONE, 2nd and Clay Sts., Oakland; 7th and Berry Sts., San Francisco.

HARMON LUMBER CO., S. H., 1st and Brannan Sts., San Francisco; 1921 Fillmore St., San Francisco.

HEALD'S BUSINESS COLLEGE, 1451 Franklin St., San Francisco.

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SMITH & CO., FRANCIS, 8th and Townsend Sts., San Francisco.

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UNITED STATES CAST IRON PIPE AND FOUNDRY CO., 951 Eddy St., San Francisco.

UNION GAS ENGINE CO., 23rd Ave., Alameda.

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The Devil's Tower.—Geologists are not agreed upon the origin of the strange-looking mass of igneous rock, called the Devil's Tower, which stands near the north brink of the canyon of the Belle Fourche river, near the South Dakota-Wyoming State line. Its composition is approximately that of typical phonolite, but whether it is a volcanic 'plug' or 'neck' or is merely a residual mass of a once large sheet of lava is a question yet undetermined. The greater number of geologists who have visited the columnar rock-mass believe it to be a plug which was injected into older sedimentary strata which have since been removed by erosion. Others insist that as the columns are practically vertical, it is a remnant of a sheet of igneous rock, all of which has been removed by erosion except this tower-like peak. The theory upon which this is based is that columnar structure in basalt and other volcanic rocks always develops in a direction normal to the flow of lava stream or dike. In streams of molten rock this is true, but the Devil's Tower seems rather to have been a plug than a stream. About forty miles to the southward is a peak known as Inyan-Kara, formed by the intrusion of lava from below, the sediments having been lifted on all sides of the central mass—what is known as a postular uplift. The core, or neck, is columnar, much like the Devil's Tower, the ohief difference being in the almost complete removal by erosion of the sedimentary beds which once surrounded the latter, and the covering of their remnants about the base of the tower by the lava blocks and columns which have fallen from its nearly perpendicular sides. No ore deposits are known to exist in connection with either the Devil's Tower or the Inyan-Kara peak intrusion.

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EDITORIAL.

IT IS PROPER to state that the inferior paper used in this issue is due to causes beyond our control. After the earthquake-fire we managed to secure a supply of good paper, pending the arrival of our regular stock. But the best laid plans are disarranged by such conditions as have been faced recently. Our paper has arrived at the railroad terminal but, owing to the congestion of traffic, it cannot be secured. There are 1,400 cars in the Oakland railroad yards which are not identified by reason of the confusion and the extra labor thrown on the officials. The traffic created by the demand for food-stuffs and supplies of every kind has been unprecedented.

TO THOSE WHO take no interest in earthquakes and their geological relations, we apologize; for this issue is rich in matter relating to this subject. But it won't occur again. In our issue of April 28 we gave the impressions and facts available immediately after the disaster of April 18, and now we publish the well-considered views of leading scientific men who have had an opportunity to investigate the facts. After this we expect to drop the subject. To those who, for reasons prompted by science or humanity, are interested in the explanation of the events that led up to the destruction of a great city and permitted of the observation of a rare geological occurrence, the pages that follow will be welcome.

THE RECORD of the Calumet & Hecla Mining Company is calculated to encourage investment in mines. Up to the end of 1905 it has produced 1,811,400,000 pounds, or about 800,000 long tons, of refined copper, worth, say, $275,000,000. Shareholders have received in dividends $92,350,000 or about 35 per cent of the value of the output. It is estimated that the cost of production has been 8.2 cents per pound of copper. During 1906 the production should be close to 100,000,000 pounds and the dividends $6,000,000. Despite the great opportunity for financial games, the management has been consistently straightforward and honorable. The mine has been conducted as a sound business and in a conservative manner, the effect of which has been beneficial to the reputation of the copper industry of Michigan.

WHEN THE EARTHQUAKE OCCURRED a Japanese professor made calculations by which he ascertained its occurrence in place and time. We refer elsewhere to Mr. Omori's formula and we publish the substance of a lecture delivered by him here during the last few days. While he was at work at Tokio, Mr. Frederick L. Ransome, of the United States Geologlcal Survey, wrote an account of the probable causes of the earthquake a few hours after the news of it reached Washington, and this was prepared long before any facts were obtainable from the locality of the disturbance. And yet he also was enabled to make a scientific forecast, for, possessing an intimate knowledge of the geology of California, he knew her lines of structural weakness and placed his finger figuratively on the very fault along which the destructive slip occurred. A few days after the event we published an article by our Mr. W. H. Storms in which he described the earthquake line, correctly, as facts now show. His knowledge was based on data gathered while field-geologist on the staff of the State Mining Bureau. A former chief of that Bureau, Mr. A. S. Cooper, contributes a short article, with useful drawings, describing the now familiar earthquake line of California.

THE DISASTROUS EFFECTS of the earthquake upon the fine group of buildings comprising Stanford University are well worth careful study by the architect and student of structural engineering. The building scheme has been beautifully carried out in the so-called 'mission' style and the yellowish tinted veneer of sandstone with the pale red tiled roofs is picturesque in the extreme. The framing is generally of light wood and the main portion of the structure is of brick (in some parts of which railroad iron was used) laid dry, in mortar—not laid wet in cement. This is covered with slabs of the soft yellow sandstone mentioned, which is obtained near San Jose. This stone is a building material admirably adapted to the climate, though liable to scale and crack in countries where there is frost. The effect of the earthquake on this method of construction is shown by a photograph which we publish on another page. The same effect may be observed on a large scale in San Francisco at the City Hall and elsewhere throughout the neighborhood of San Francisco Bay. On the other hand, Robles Hall and the central block of the Museum and Art Gallery, both of which were built of tinted cement blocks, appear to have withstood the shock well. In some parts of the quadrangle and other places the work was done by day's labor and consists of solid stone; here the walls have stood better than the combination of brick with stone veneer—done by contract work. In many places the keystones of the arches along the corridors have slipped down, although the supporting pillars have apparently not spread. This could probably be obviated by designing the arch-stones of greater width, giving them a consequently greater keying power. The tower of the new library building is framed of structural steel and has remained intact, though the covering of masonry was demolished. Fortunately for the progress of education, few of the injured portions had as yet been occupied and there will be but little interruption to the classes at the University.

Bad Language.

We do not refer to profanity but to a scientific terminology that limits the usefulness of a geological pamphlet. It happens to be one of particular interest at this time, namely, the report of the Earthquake Commission. This report was prepared for the State of California at the instance of several scientific men and by order of the Governor. On the face of it, the report is intended to allay alarm and to explain to the public the scientific facts of the case. This is a laudable purpose. And the findings of the Commission are decisive. It did good work. But why in the name of common sense should a document intended for non-scientific readers be written in language that is needlessly and awkwardly technical? The first sentence of the actual explanation starts out with reference to "a line of peculiar geomorphic expression." The expression is as peculiar as the line; a 'peculiar topography' or 'an unusual earth-form' would have conveyed the same idea with much less of irritation to the average reader. Then mention is made of factors that will "contribute much to geophysical conceptions." The frequent use of "coseismal curves" and "fault scarps," without any explanation, is calculated to cause stumbling among laymen. All such terms are known to the scientific and they can be worried out with the help of a dictionary even by the average citizen, but here is a report, of unquestioned value and interest, prepared by first-rate men, and intended to allay the fears while ministering to the knowledge of the general public, and yet it contains a large number of technical terms, some of which are unnecessary, while others that are necessary appear without such explanation of their meaning as courtesy demands. It is a good example of the supercilious attitude of the scientific hierarchy We are reminded of an incident in a play called the 'Merry Monarch.' A lady

asks a foreign minister "What is this diplomacy you speak of so respectfully?" The reply is "If you did know what it meant, it would not be diplomacy."

Concerning the Earthquake.

On another page we publish the chief portion of the report of the Commission appointed to investigate the earthquake that led up to the San Francisco conflagration. It is calculated admirably to fulfil the purpose for which it was designed, namely, to allay the alarm based on popular misconception of the occurrence and to ascertain the immediate geologic cause of the disturbance. While the report is the work of a committee consisting of eight men, aided by capable assistants, it is obvious, from internal evidence, that it is to be credited mainly to Mr. A. C. Lawson, professor of geology in the University of California, who took the first steps that led to the appointment and subsequently organized the investigation. The report is signed by him, as chairman, and by Professor A. O. Leuschner, as secretary.

It is a conclusive contribution to science. The earthquake is proved to have originated along an old line of faulting which traverses the coast of California, and though the ultimate source of the movement must ever remain an obscure problem, the immediate cause is ascertained. The centre of disturbance was at the head of Tomales bay, 32 miles from San Francisco, but the shock was transmitted along a zone that follows an old fault for 375 miles. The maximum horizontal dislocation was about 20 feet, but over the 185 miles actually examined the surface movement averaged 10 feet. The vertical break was much less, the maximum observed being not more than four feet. Destructive effects extended for a distance of 25 to 30 miles on each side of the rift, although these observations are complicated by the possible occurrence of other lines of movement. The report does not refer to it, but it is likely that there was another rupture, traversing the eastern side of the Contra Costa hills, across Mare Island and through Sonoma county. The main line of disturbance, and the only one positively ascertained, cuts obliquely through the Santa Cruz mountains and is independent of such topography as it is due directly to ordinary erosion. It had been noted and described several years ago, for this reason. That is to say, it is the track of an old break in the earth's surface of a magnitude far exceeding the recent small slip and the movements which it marks must have been as much greater than the recent disturbance as a railroad collision surpasses the encounter of two persons in a crowd. The big fault originated far back in geologic time; it probably antedated man's first appearance and each succeeding movement involved intervals of time so great as to make human history an inadequate measure. Therefore, from a practical standpoint the proof of earlier disturbances and the suggestion of others yet to come, need cause no alarm, for it is the geologist who speaks, and he deals with time extravagantly. As to the effect on buildings, the Commission's report confirms the first inferences, which were those made on the occasion of previous earthquakes—and disregarded. Structures built on made ground or on alluvial soil suffered severely, because in such foundations the earth-waves are of maximum amplitude. If a jelly be placed in a porcelain bowl and if the latter be tapped, the vibrations pass through the highly elastic medium of the bowl in swift but minute waves that produce no apparent effect, but when they strike the jelly, their amplitude is enlarged and their period increased so that the jelly wobbles freely. A building on made ground behaves like a crumb perched on the jelly, but if piles be driven through the mud or gravel to the solid rock, then the building is anchored to the rock and moves with it—hardly at all. The same is true, with more assurance, of structures standing on the solid rock itself. It is the horizontal vibration that does the damage, the vertical component being slight and rarely destructive. On April 18 the vertical vibration was insignificant; the horizontal was about three inches in San Francisco itself. To most people even this seems wholly inadequate to account for the fearful result, but it must be remembered that the effect of each vibration of three inches becomes magnified by the acceleration of gravity, in other words, a pendulum motion is started, which may culminate, if the vibrations continue long, in a swing of a foot or more. The earthquake of April 18 was so destructive because it lasted a relatively long time—one minute and five seconds. The actual collapse of chimneys, copings, and structures in general, occurred toward the end of the second portion of the shock. Since the fateful day there have been many shocks, some of them severe, but all so short as to have done no harm. We presume that the final report of the Commission will be a volume, well illustrated with photographs, but it is not likely to add much to the essential facts as already given. No disturbance in nature producing great loss to humanity has ever been so quickly diagnosed or so successfully explained. And while man may justly pride himself on the quickening of his perception of the causes of things, he will remain humble in the face of his inability to ascertain the ultimate cause.

An Earthquake Formula.

Among the most interesting episodes connected with the scientific study of the recent disturbance in California, was the determination in Japan, by Mr. F. Omori, professor of seismology in the Tokio Imperial University, of the exact locality and time of the shock. This was done by an empirical formula, based on numerous observations of earlier earthquakes; the formula had been tested on several previous occasions, by its author, an acknowledged authority on the subject, and it had been printed eight years ago in the publications of the Earthquake Investigation Commission, of Tokio. Professor Omori's determination on this occasion was based on the record of his own seismograph at Tokio and the known fact that the length of the preliminary tremors indicates the distance of the point of observation from the place of origin of the earthquake.

We have Professor Omori's account of the calculations as published in Japan; as this is no place for them, we summarize by stating that the time the earthquake commenced at Tokio was 10 hr. 24 min. 35 sec. (Japanese time) on the night of April 18, the total duration being about five hours. The first preliminary tremors lasted 9 min. 49 sec., from which the approximate distance was calculated to be about 8,700 kilometres or, say, 5,400 miles. The actual distance from Tokio to San Francisco is 5,403 miles. By another formula he determined the time of the earthquake to have been 5 hr. 13 min. 5 sec., which many of us can testify to be an extraordinarily close approximation. The standard clock at the observatory of the University of California at Berkeley stopped at 5 hr. 12 min. 38 seconds.

The preliminary tremors represent those vibrations of small amplitude and short period which travel faster than the earth-waves that cause the heavy shocks; these smaller vibrations are also the ones that carry sound with them and while they originate at the same time, they travel so much faster as to precede the earthquake proper. At the Lick Observatory on Mt. Hamilton, the Ewing seismograph registered the introductory small movements for ten seconds, from which it is inferred that the central part of the great disturbance was at a distance of 80 miles. From Mt. Hamilton to the head of Tomales bay it is 83 miles. At the Berkeley observatory the Ewing seismograph was thrown out of adjustment by the violence of the shock, the magnitude of each component exceeding the range of the machine. The record of the preliminary tremors also is wanting.

Another feature is interesting. It appears that the first preliminary tremors were recorded at Tokio 11 min. 30 sec. after they were felt at San Francisco. As the direct spherical distance between these cities is 5,403 miles (as calculated from difference of longitude along an almost equal latitude), the velocity of propagation was 7.8 miles per second. On the other hand, at the observatory of the United States Weather Bureau at Washington, the preliminary tremors began at 8 hr. 19 min. 50 sec.; they were felt in Berkeley at 5 hr. 12 min. 6 sec., from which, after deducting the three hours difference between Eastern and Pacific time, it is apparent that they took 7 min. 44 sec. to travel the 2,413 miles to Washington, or at the rate of 5.2 miles per second. This appears to be a discrepancy, but it is not. The explanation would be highly technical; suffice it to say that the velocity of propagation varies with, or is a function of, the distance. At Washington the preliminary tremors lasted 5 min. 10 sec., as deduced by us from an examination of the printed seismographic record; taking this interval, the Omori formula gives an estimated distance of 2,443 miles from the place of earthquake origin; the measured distance being 2,422 miles. At London the shock was recorded twice and possibly three times, the first being that which was propagated along the shorter spherical distance, while the second was the vibration that traveled the other way around the globe; the third being the first after a complete circuit of the earth. Until recently it was believed that the vibrations took two paths, a shorter one through the earth, along the chord of the arc, and a longer one in a line parallel to the curved surface; but now the Japanese base their measurements on the latter, while the English seismologists, led by John Milne, stick to the first. At Tokio, Professor Omori records the vibration at 10 hr. 24 min. 35 sec. (Japanese time) as that which came direct along the shortest spherical route or minor arc, while another series of vibrations commencing at 31 minutes after midnight, or 2 hr. 6 min. 35 sec. later, he attributes to the vibration propagated along the major arc of the earth, from California southeastward through South America, the Atlantic and the Indian oceans, to Japan. Of course, the passage of these vibrations is affected by the composition or coherence of the rocks through which they pass, but over long distances there is a tendency to average, so that this perturbing factor becomes eliminated.

The test of scientific theory is prediction; Mr. Omori dates his 'Note on the San Francisco Earthquake' at Tokio on April 25, but we understand from him that his calculations were made before the cable had told him when and where the earthquake had originated. Therefore his was a notable achievement.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

Limpid oil mixed with graphite is successfully employed as a lubricant on many bearings.

Alaska is now the winter home of many of the Far North adventurers, 3800 people remaining at Nome during the past winter.

A box 14 ft. long and 10 ft. wide, filled with ore to a height of five feet, or a pile of quartzose ore of these dimensions contains 35 tons.

The difference in length (not the total length) of a set of drills ranges from six to eight inches in starters, up to 18 in. to two feet in long drills.

During 1905 the railroads of the United States utilized 80,051,000 wooden ties. This should prompt the more extended use of metal or concrete ties.

Singulo-silicate is a term applied to certain slags wherein the ratio of the oxygen combined in the silica, is to the oxygen combined in the bases as 1 to 1.

In smelting copper ores, slags can be made which are high in silica, but the furnace will run more slowly, and if extreme care is not taken, a freeze will result.

The Buffalo and Susquehanna Iron Co. at Buffalo, use the gas from iron blast furnaces as fuel under their boilers, the steam being utilized in operating hoisting engines.

No place on earth is immune from earthquake. A short time previous to the Charleston earthquake, the city of New York was visited by a slight but very noticeable shock.

Fuller's earth consists of clay mixed with just enough fine silicious material to take away the plastic properties, so that it disintegrates into powder when mixed with water.

At Allentown, Pa., lime is burned with coke instead of with coal as is usually done in the East. Throughout the West most of the lime is made with various kinds of wood as fuel.

Argentite is silver sulphide, and should not be confounded with argentine which is a variety of calcite having a pearly luster, and slightly undulating surface. It is white, grayish or yellowish in color.

Earth, when first picked loose and shoveled into cars, occupies more space than it did in place, but when dumped and allowed to settle, it shrinks, and frequently takes less space than it did in place in the bank.

In some mines when contractors or lessees are at work, furnishing their own supplies, it has been found desirable for the company to issue to their days-pay men colored candles, which may be readily distinguished from other kinds.

There is no cohesion between wood and cement, and no dependence should be placed on such probability where strength is required. Concrete prevents the oxidation of iron and steel embedded in it, probably by excluding the oxygen of the air.

The toughest 'picking' ground is probably frozen clay. Rocks, such as tuffs, rotten granite, etc., too soft and friable to drill by the usual methods, may be bored with a suitable auger. A low-grade powder should be used in this kind of ground.

When figuring on concrete foundations, or walls, provide sufficient rock to completely fill the mould, counting nothing for the cement and sand. These latter fill the voids in the mass of broken stone and add nothing to the volume of the concrete.

It is seldom that ore picked up at random on a mine-dump can be relied upon to furnish an idea of the value of the vein. In the event of the ore in the vein being of uniform grade this might be possible, but it would be an unsafe means of information.

It is almost impossible to sink a shaft clear of a given sized set of timbers in blocky ground without numerous large excavations extending beyond the neat lines required. These should be filled with rock or timber placed back of the lagging, if the ground does not stand well.

Diamond drills have frequently been used in making connection between tunnels and higher flooded old workings. By this means the water may sometimes be removed from old works with safety and under control, where to make direct connection by drift or raise would result in disaster.

Phosphorescence in minerals is that property which causes them to emit light for some time after heating, exposure to light, or to an electrical discharge. Fluorite becomes phosphorescent upon being heated to about 150° C. Different varieties of the mineral give off different colors of light.

It is impossible to tell, even approximately, what the matte-fall in the furnace will be from a charge of certain composition without having had experience. Smelter men who are well up in their business can usually form a very fair idea; it is knowledge which must be gained by experience.

Machine-drill hose is wrapped with flat wire to protect the hose from damage likely to occur in its use underground, but few, if any, brands of hose will stand having machines thrown down on them, or withstand blasting. Careless miners occasionally subject air-hose to both of these strenuous tests of endurance.

The depth at which water may be obtained in desert dry lakes is impossible to anticipate. In a number of instances in California a good flow has been obtained between 80 and 100 ft. and occasionally at 20 ft. or even less, but in other cases the water-level is more than 100 ft. and in any event the water may be neither abundant nor serviceable.

An acetylene blow-pipe, in which oxygen is used with acetylene, has been invented. With its use a very high temperature is obtained, owing to the absence of inert nitrogen from the flame. It is claimed that with it a rod of pure iron serves as a soldering stick, and the heat is so great that a little of the carbon in the flame unites with the iron, converting it into mild steel.

In treating silver sulphides by the cyanide process, the finer the ore is ground the more quickly will the silver be acted on by the solutions. To grind fine is expensive. If fine grinding is not resorted to, the consumption of cyanide will be high and consequently expensive. Between these two evils the cyanide operator must find a happy medium, aiming to accomplish the best results at least cost.

The new slime-treatment plant of the Homestake Co. being built on the slope of McGovern hill, at Deadwood, will contain when completed, 26 large continuously operating filter presses. In this plant it is expected to treat 1800 tons of auriferous slime daily. Heretofore the greater part of this material has been utilized to sluice out the sand from the large vats in the works at Lead and Gayville, and it has flowed to waste with the tailing. This slime, containing less than $1.50 per ton, will be treated at a profit.

Much time is often unnecessarily lost in trying to recover a fitchered hole in drilling with machines. If after two or three trials and careful running the hole cannot be reamed out, and drilling proceed as before, it is generally better to abandon the hole, and start another. Ordinarily holes do not fitcher until deep enough to be of some service in blasting the round. Occasionally a badly fitchered hole may be finished by substituting a chisel-bit drill for the ordinary cross-bit.

Recent extensive investigation of underground temperatures in the mine workings and bore holes on the Rand, South Africa, have demonstrated that the increase of temperature is one degree for each 208 ft. Starting from a mean temperature of 68.75° at 1000 ft. depth, the following was deduced: 1000 ft.=68.75°; 2000 ft.=73.55°; 3000 ft.=78.35°; 4000 ft.=83.15°; 5000 ft.=87.95°; 6000 ft.=92.75°; 7000 ft.=97.25°; 8000 ft. =102.35°. All temperature measurements are Fahrenheit. Good ventilation in mines always has a tendency to reduce the temperature, both of the workings and of the rocks themselves. These measurements have been taken in a region where little metamorphism has occurred, and where there are no large masses of decomposing rocks, such as those on the Comstock Lode of Nevada where high temperatures are common at comparatively moderate depths.

When it is the intention to close down a mine for an indefinite period it is a wise thing to place a substantial platform in the shaft some distance below the collar, and preferably at the natural water-level. In the event of the upper portion of the shaft caving, the debris may fall no further than the platform, which will result in a great saving in case it is desired to re-open the mine.

It has been learned by experience that it is unwise to set the battery-posts of a stamp-mill directly upon concrete mortar-blocks, as the posts in a few months become somewhat rounded from the constant vibration and slight impact, so much so as to ultimately seriously interfere with the running of the cam-shaft. A piece of heavy timber must be placed flat on the concrete block, and between it and the lower end of the post.

Owing to uncertainties which may be encountered in shaft-sinking, miners, though willing to sign a contract to sink a shaft, with the proviso of a forfeit in the event of non-fulfilment of contract, are unwilling to give a bond for the completion of such work. Shaft-sinking, and most other mining work is wholly different from building and similar construction which is frequently undertaken on contract. In the latter, the factors are known and are constant, or nearly so, but in mining work the element of uncertainty is too great to make it safe to take contracts under bond.

The steel wire spirally wound inside the suction hose of a mine pump is to prevent collapse of the hose from atmospheric pressure when the pump is in action. The hose should be wrapped on the outside throughout its entire length with Manila rope at least ⅝ in. diameter to protect it from possible injury from flying rock, when blasting, and when pumping to prevent abrasion from contact with timbers or rocks, which would result in cutting a hole through the hose, if not protected in some manner. It is also a wise precaution to suspend the hose by ropes that it may touch nothing below the pump when pumping, thus still further minimizing the danger of abrasion.

When the character of the ground, or of the shaft itself, when sinking, is such that timbers must be carried close to the bottom, damage to the timbers from blasting may be averted to a great extent by employing fenders underneath the wall-plates. These may be made either of green timbers, or of soft steel plates bent to fit the front and bottom of each plate. Either the timber fenders or steel plates are secured to the shaft-timber set by suitable bolts having solid square heads, which pass upward through the unoccupied hanging-bolt holes in the plates. This precaution not only saves the timber from being cut and slivered, but may also prevent its being broken. The scheme here proposed has frequently been employed with satisfactory results.

It is part of the duty of the shift-boss or the foreman to know how long his muckers should take, and how long they do take, to fill a car by shoveling, and how many cars per man per shift of both waste and ore are sent to the shaft, or out of the tunnel. Not only this, but he should know how long trammers loading from chutes usually take to fill their cars. If stoppages are frequent owing to large pieces of ore jamming in the gateway, the fault lies, not with the trammer, but with the miners in the stope above, and it should be seen that no large pieces are thrown into the mill-hole. There are many small things happening constantly in the mine, things little in themselves, but which in the aggregate are material in the item of cost. Among these are the frequent derailing of loaded cars. If this occurs more than once at the same place the fault probably lies in the track, which should at once be fixed so as to prevent the recurrence of a similar trouble. It pays to put in good tracks and to keep them clear. It is poor business to keep three or more shovelers waiting from two to five minutes for a car, for if this occurs at all, it is likely to be repeated every 15 to 20 minutes, depending on the number of shovelers. Avoid long waits, they are expensive and demoralizing.

The Probable Cause of the San Francisco Earthquake.

By Frederick L. Ransome.

Most authorities on earthquakes distinguish two main classes—(1) volcanic quakes and (2) tectonic, or dislocation, quakes. The former originate in districts of active vulcanism and at comparatively shallow depth. According to Major C. E. Dutton, the greater number of such shocks are initiated at depths less than two miles. They are characterized by a fairly definite centrum, a relatively short radius of influence, and the absence of subordinate after-quakes. They are phenomena that could probably be closely imitated by the explosion of a large quantity of dynamite at the bottom of a deep mine. Tectonic quakes, on the other hand, may originate at greater depth; they usually have indefinite or elongated centra they are characterized by a greater radius of activity, and the main shock is usually followed by after-quakes. Most of the great destructive earthquakes recorded in history belong to this class. Such, for example, was the Mino-Owari earthquake in Japan, which in 1891 killed over 7,000 people, wounded over 17,000 more, and destroyed more than 200,000 houses. This quake was plainly caused by movement along a fissure which appeared at the surface as a fault about 70 miles long, with a maximum throw of 20 ft. Prof. John Milne, after an exhaustive study of the seismological records of Japan, concluded that shocks are most frequent in districts that exhibit evidence of elevation or subsidence still in progress.

Four kinds of waves are generated in most earthquake shocks: (1) normal waves, (2) transverse waves, (3) surface waves, and (4) epifocal waves. The first three depend upon the elasticity of the rocks traversed, are not visible, and although propagated with different velocities, are not always distinguishable. The last are the visual waves, resembling, as Major Dutton says, flat waves on water. They are characteristic of the epicentral tract of many great earthquakes and are highly destructive. They bear no clear relation to elasticity and result from the passage of the deeper waves from an elastic medium (solid rock) into a feebly elastic medium, such as soil or unconsolidated sediments. They thus account for the ruin often wrought in valleys and in low ground when structures on near-by hills escape.

The frequency of earthquakes in California is well known, and tremors sufficient to rattle the windows of dwellings in San Francisco have in the past been so common as to excite little alarm and arouse but passing interest. The number of quakes recorded in San Francisco from 1850 to 1886 is 254, and 514 additional shocks were noted in the same period in other parts of California. They are undoubtedly more prevalent in the region surrounding the Bay of San Francisco than in the northern or southern extremities of the State. While most of the southern quakes have effected no damage, others, such as the great shock in 1868, which injured San Francisco, the Owens Valley earthquake in 1872, the Vacaville earthquake in 1892, and the Mare Island earthquake in 1898 were notably destructive. In general, it may be said that the earthquakes in California exhibit the features characteristic of tectonic quakes, and the Owens Valley shock is generally ascribed to movement along the great fault limiting the Sierra Nevada on the east.

A section across central California, say, from Monterey bay to Mono lake—shows three well-marked topographic divisions. On the northeast is the gentle western slope of the Sierra Nevada, about 70 miles broad, which rises gradually from the eastern edge of the main interior valley to the crest of the great scarp overlooking the deserts of Nevada. The range is essentially a huge fault-block composed of Jurassic and older rocks and partly covered by Tertiary lavas.

The Great Valley is in the main an alluvial plain 50 to 60 miles wide, its northern part drained by the Sacramento river and its southern part by the San Joaquin. Both streams flow into the head of Suisun bay and their waters find their way across a depression in the third topographic division, the Coast Range, through San Francisco bay and the Golden Gate into the Pacific.

The Coast Range separates the Great Valley of California from the Pacific ocean. It comprises numerous nearly parallel ridges separated by narrow alluvial valleys and constitutes a generally mountainous belt 60 miles in width. Both in lithology and structure it presents a marked contrast to the Sierra Nevada, although the relations of the two ranges in the northern and southern parts of the State are not as yet fully understood.

The oldest rocks known in the Coast Range are limestones and quartzites, with some crystalline schists, and are exposed at various localities from Point Reyes, north of San Francisco, to San Luis Obispo. These rocks, which are probably Paleozoic, are cut by granite supposed to be of the same general age as the main granitic intrusions of the Sierra Nevada, which are known to be post-Jurassic. All of these rocks, after being above sea-level long enough to be extensively eroded, were submerged and were covered by a series of sediments several thousand feet thick, known, from its characteristic development at San Francisco and on the north side of the Golden Gate, as the Franciscan, or Golden Gate series. Although the Franciscan consists mainly of sandstone such as forms the well-known Telegraph Hill in San Francisco and the larger islands in the bay, it contains also some of the most interesting and characteristic rocks of the Western coast, such as the serpentines, the blue glaucophane schists, with their wonderful mineralogical variety, and peculiar jaspery rocks made up in part of the silicious skeletons of radiolaria. The age of the Franciscan series, which forms a large part of the Coast Range, is still open to question. It is thought by some geologists to be Jurassic, by others to be early Cretaceous.

The deposition of the Franciscan sediments was ended by an upward movment of the sea bottom. They were folded and faulted, lifted above sea-level and eroded by streams and waves. Again, however, the land went down, the Franciscan rocks sank beneath the sea and were covered by thousands of feet of fossiliferous Cretaceous, Eocene, and Miocene deposits. The sediments of the last period alone attained a thickness of over 8,000 ft. At the close of the Miocene and after minor oscillations of level the rocks were again raised above sea-level and were crumpled and faulted by the energy of the uplift until they formed a well-defined range separating the ocean from the interior valley. In Pliocene time the land again subsided, although the Coast Range was probably not wholly submerged, and marine deposits of this period were laid down in sounds or inlets.

Here belongs the San Pablo formation, a thick accumulation of sandstone with intercalated volcanic tuffs. Apparently during the later stages of San Pablo deposition new movements of the land took place whereby fresh-water basins were formed, in which accumulated over 3,000 ft. of sediments and lava flows—the Berkeleyan and Campan series of Professor Lawson. Nor is this all. Still later in the Pliocene was deposited the Merced series, which is exposed along the ocean beach west of San Francisco. This remarkable deposit, described and named by Professor Lawson, is a mile in thickness and has at its base the well-preserved remnants of a coniferous forest. Thus a portion of the Tertiary land upon which pines, indistinguishable from the species now growing at Monterey, sank beneath the waves to a depth of at least 5,000 ft., and so rapidly that the trees were buried under sediments before they could decay. Finally the Merced series, carrying in its upper beds fossils of Quaternary age—the mere yesterday of geological time—have been elevated above the sea, tilted up at angles as high as 75°, and dislocated by a fault of at least 7,000 ft. throw.

If anyone will look at a good map of California he can scarcely fail to notice the striking parallelism of structure shown by that part of the State lying north of Tulare lake and south of Red Bluff, near the head of the Sacramento valley. This parallelism is not confined to the two main ranges, the Great Valley and the coast line, but is conspicuously shown by the ridges and valleys of the Coast Range. In the absence of local geological knowledge, this feature of the topography might be ascribed to regular folding, such as that of the Appalachians. The actual complexity of the folding, however, and the fact that the structural details of the ridges show little accord with the general topographic regularity referred to, dispose effectually of this suggestion. There can be little doubt that the principal longitudinal ridges and valleys of the Coast Range are due to faulting modified by erosion. Much detailed work remains to be done before the positions and throws of all these faults can be determined, but such careful structural studies as have been made of definite areas have invariably revealed the great importance of dislocations having a generally north-northwest trend. This is particularly true of the San Francisco peninsula, which, as Prof. Lawson has shown, is traversed by at least three great faults belonging to this dominant system. These have been plotted on the accompanying outline map of the region about San Francisco bay and relief map of the peninsula. The San Bruno fault has a throw of at least 7,000 ft. near San Francisco, the southwest side having dropped relative to the northeast side. In all probability this same fault determines the positions of Bolinas and Tomales bays, north of the Golden Gate, and the straightness of the coast line as far as Point Arena, 100 miles northwest of San Francisco. Toward the south the same fault, or one belonging to the same zone, is said to be traceable almost to the Gulf of California, and in parts of southern California, is locally known as "the earthquake crack." The San Andreas fault, which, as may be seen from the small relief map, is followed by a rectilinear ravine occupied by a chain of ponds and lakelets whose existence is proof of recent disturbance. The third, or Pilarcitos, fault has not impressed its presence upon the topography of the peninsula in so conspicuous a manner as the other two. It is highly

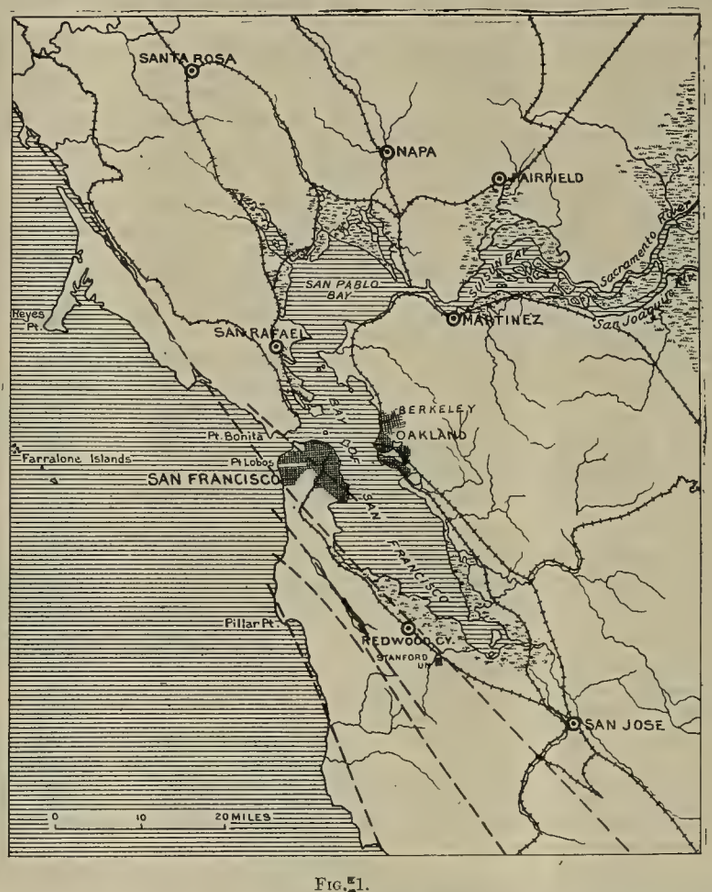


Fig. 1.

probable that future careful work will discover other great faults generally parallel with those mentioned. There is a strong suggestion, for example, of a fault passing near San Jose, along the eastern margin of the bay (see Fig. 1), through Santa Rosa, and northwestward along the valley of the Russian river past Ukiah. *

Another Earthquake Theory.

In 'Popular Science Monthly' there is an important article, taken from the London 'Times,' and written by Mr. H. H. Turner, professor in Oxford University, dealing with earthquakes. Professor Turner says:

Professor Milne, in the tenth report of the British Association committee, refers the 'world-shaking' earthquakes observed in the six years 1899-1905 to thirteen great earthquake regions, designated by the first thirteen letters of the alphabet. Three of these, I, J. and L, are responsible for only five, three and two shocks respectively, and are thus of small importance compared with the others, which average about forty shocks each. Excluding them for the present, the remaining ten regions lie approximately in two rings on the earth's surface, a configuration which is most strikingly apparent when the regions are marked on a globe. The more important ring includes the following seven regions: A (Alaskan coast), B (Californian coast), C (West Indies), D (Chilian coast), M (South of New Zealand), F (Krakatoa region), E (Japan). Its centre is among the conspicuous group of islands which includes Tahiti, and the radius of the ring is about 65 degrees. The other ring has its centre at the opposite point of the earth, which is in the Sahara desert; and at a radius of 50 degrees from this centre lie regions G (between India and Madagascar), H (the Azores) and K (Tashkend). Now, this is not merely a convenient geographical summary, but a physical fact of vital importance, according to recent researches by Professor Jeans. In a remarkable paper read before the Royal Society in 1903 he gave reasons for believing that the earth is by no means a sphere or a spheroid, as we have been accustomed to think, but is of a pear-shape. Under gravitational stress it is continually approaching the spheroidal form, the pear is being crushed into a sphere by its own attraction; and the result is a series of earthquakes. These naturally occur in the weakest places, and if any one will experiment in crushing a pear towards a spherical shape, or even draw a diagram and consider where the weakest points would be, the reasons for the existence of two rings of greatest weakness will readily suggest themselves. The ends of the pear are the centres of these rings, one in Africa, one in the Pacific; and when once this is pointed out, the pear-shape of the earth is, according to Professor Sollas, 'obvious to mere inspection; it is a geographical fact and not a speculation.' Professor Sollas is indeed responsible for the particular suggestion above sketched; for Professor Jeans had originally proposed a different axis, which he withdrew in favor of the obvious improvement. The confirmation of Professor Sollas' view from the distribution of earthquake centres is remarkable. It does not seem, however, quite certain which is the blunt end of the pear; it has been hitherto placed in Africa, but there seem to be several reasons for regarding Africa as the stalk end. This point cannot, however, be dealt with here. The important thing is that there seems to be a real reason for the occurrence of earthquakes in these particular regions, and that they will probably continue to occur there. Professor Jeans' conclusions have recently been examined by Lord Rayleigh, who announced at the Royal Society only a few weeks ago that he found them generally confirmed, and that we must regard our earth as at present in a state far from stable.

We come to the second point, the distribution of earthquakes in time. Are there seasons of special activity such as the recent occurrence of several disasters seems to suggest? Here our knowledge is slighter still, and the observed facts have not yet been co-ordinated by a mathematical investigation. Still there seems to be some evidence in support of the view that exceptional irregularities in the rotation of our earth may be responsible for an increased number of earthquakes at particular times. That the evidence is slight must be attributed to the shortness of the time during which it has been possible to obtain it, and not necessarily to inherent weakness in the evidence itself. The brevity of the earthquake record has been mentioned above; that of irregularities in the earth's rotation is longer; but the discovery that such irregularities existed was made only twenty years ago

*Abstract from the current issue of the 'National Geographic Magazine.'

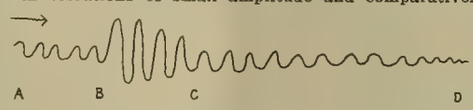
Observations of Distant Earthquakes.

Written for the MINING AND SCIENTIFIC PRESS by F. OMORI.

The motion of an earthquake consists of several sets of vibrations, the amplitude and period of which differ widely. It is convenient to divide this motion into the sensible or macro-seismic, namely, that which can be felt as tremblings or shocks; and the insensible or micro-seismic, which can not be felt. In the former, quick vibrations co-exist with slower ones, while in the latter quick vibrations are either absent or extremely minute. Some of the vibrations in the insensible motion are as large as those that are felt in local earthquakes; they are insensible only because their period is long and, consequently, their acceleration small; the lowest acceleration of the sensible motion being about 17 mm. or 0.67 in. per sec. The waves of quick period and short length are dissipated with increase of distance from the center of disturbance, more rapidly than the slow and long waves; the result being that the motion due to a distant earthquake is simpler in character than that due to a near one; it is entirely micro-seismic or insensible. By a "distant earthquake" is meant one whose epi-central* distance from a given station is at least 2,000 km. or 1,200 miles.

The earth's crust may be regarded as an elastic medium through which seismic waves are propagated. They are recorded and measured by the seismograph, a modern instrument of extreme sensitiveness. By the aid of it we can observe a great earthquake in any part of the world, the motion due to such a disturbance lasting generally from one to five hours.

Near Earthquakes. In an ordinary earthquake, the motion, as observed with a seismograph, begins always with vibrations of small amplitude and comparatively



A B. Preliminary tremors.
B C. Principal part.
C D. End portion.

short period. These are known as the 'preliminary tremors' and last from a few seconds to a few minutes; next come those of large amplitude, constituting the 'principal' part; and finally the earthquake ends with feeble movements. When the origin of the disturbance is near to the observer, a sound resembling distant thunder or a rushing wind is heard just before the arrival of the ground-trembling. These sound phenomena, which are of frequent occurrence in a rocky district, but rare on the plains, are credited to the rapid vibrations existing in the 'preliminary tremor'. The fact that animals show signs of disquietude just before an earthquake, is probably due to their acute senses, enabling them to feel the first movement of the preliminary tremors. The duration of the preliminary tremors does not depend on the magnitude of the earthquake; on the contrary, it varies with the radial distance. Thus, if Y denote the duration (in seconds) of the preliminary tremors of an earthquake at a place, whose distance (in kilometres) from the origin of disturbance is X, we have the following empirical equation:

$$X = 7.27Y + 38$$

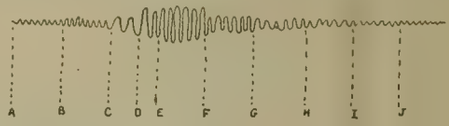
which is to be used for values of X between 100 and 1,000 km. This equation enables us to estimate, from the diagram taken by a sufficiently sensitive seismograph, the distance of the earthquake origin. And if the seismograph records be simultaneously taken at two or more stations, we can determine the approximate position of the origin. As an example, I refer to the excellent Ewing seismograph record taken by Dr. Campbell at the Lick Observatory. According to that seismogram, the preliminary tremor on April 18 lasted about 10 to 12 seconds, from which it may be inferred that the central part of the great disturbance was at a distance of about 120 km., or 75 to 80 miles, from Mount Hamilton.

The duration of the strongest part of the principal portion of the vibrations ordinarily varies between 4 and 10 seconds, but in cases of destructive disturbance, it reaches 30 seconds or more. From the Lick Observatory seismogram, the duration of the principal portion in the recent great shaking seems to have been about 40 seconds..

In slight earthquakes, the movement of the ground is small, a mere fraction of an inch. When the motion reaches half an inch, the earthquake becomes strong and may cause damage. When, however, the motion extends into inches, the effect is destructive, and ordinary brick houses, chimneys, etc., succumb. The motion in the strongly shaken parts of San Francisco was probably three inches.

In ordinary cases, the vertical component of earthquake motion is much smaller than the horizontal, being, even when greatest, unable by itself to produce serious damage. In fact, in this regard the vertical component is only of secondary importance; in other words, the seismic damage to structures may, with rare exceptions, be regarded as due wholly to the horizontal motion.

Distant Earthquakes. A careful examination of seismograms shows that the motion consists of several phases, in each of which the period remains essentially constant, while the amplitude is also on the whole constant, except for the occurrence of maximum and minimum groups.



Diagrammatic Representation of the Earthquake Motion Proceeding from a Distant Origin.

a b. First preliminary tremors.
b c. Second preliminary tremors.
c d. First phase of the principal portion.
d e. Second phase of the principal portion.
e f. Third phase of the principal portion.
f g. Fourth phase of the principal portion.
j. End portion.

The successive phases of the earthquake motion, illustrated in the figure, are as follows:

The 'preliminary tremor,' which consists of vibrations of small amplitude and of short period, is divided into the earlier portion or the first preliminary tremor, and the later portion or the second preliminary tremor. Commencement of the latter is marked by an increase of amplitude and, in many cases, also by the appearance of slow undulations.

The 'principal portion' denotes the most active part of an earthquake, and consists of movements of larger amplitude. The earlier part is further subdivided into three successive stages as follows: (a) The first phase, consisting of a few very slow movements; (b) the second phase, consisting of slow movements, whose period is generally shorter than in the first phase; (c) the third phase, consisting of vibrations of a period much quicker than that in the preceding two phases. The third phase is followed by others of small amplitude. In earthquakes of near origin, the motion, on account of the existence of quick vibrations of macro-seismic character, is much more complex than in distant earthquakes, and it becomes difficult to subdivide the principal portion into the different phases.

Lastly, the 'end portion' denotes the feeble finishing part of earthquake motion.

As in the case of near earthquakes, the duration of the preliminary tremors at a given place is found to depend on the distance from the origin: Thus let X denote the arcual distance* (in kilometres) between the epicentre and the observing place, and Y the total duration (in seconds) of the first and second preliminary tremors, then we have the following empirical relation:

$$X = 6.54Y - 720$$

which has been deduced from the observation of different earthquakes when X varied between 2,000 and 14,000 km. Again, if Y_1 denote the duration in seconds) of the first preliminary tremor, X having the same signification as before, we get the following formula:

$$X = 17.1Y_1 - 1360$$

Each of these equations may be used for determining at once the distance of an unknown earthquake, from the record taken at any given place.

The time (T) of occurrence at the origin of any distant earthquake may approximately be calculated, from the seismographic record, by the following empirical formula:

$$T = t - 1.165Y$$

where Y has the same meaning as before, and t denotes the time of earthquake occurrence observed at a given place.

Pulsatory Oscillations.—Before going further, let me refer to a phenomenon called 'pulsatory oscillations.' These are small and slow pulse-like movements that are not of earthquake origin; they denote the fact that the ground is in a state of vibration even when there is no earthquake at all. As the period of these pulsatory oscillations varies but little, and remains constant for several successive hours, it may be supposed that they represent the proper vibrations of certain portions of the earth's crust, such for instance as the plain of Musashi on which Tokio is situated. The different por-

*The epi-centrum is the point on the surface vertically above the place where the earthquake originated.—EDITOR.

*(That is, as measured along the curvature of the earth, or the arc-distance.)

tions of the earth's crust appear to be in continual movement, and the period of some of these vibrations ought to be determinable in each case from the geotectonic circumstances of the locality. For instance, a careful examination of the horizontal pendulum diagrams obtained at Tokio shows that the pulsatory oscillations are essentially vibrations with a period of about 4 seconds, more or less mixed up with those of a period of about 8 seconds. The vibrations of 4 seconds' period occur frequently, but cases are not wanting, where the vibrations of the 8 seconds' period predominate. Again other cases occur, in which the two kinds of vibrations are recorded in different parts of one and the same diagram. The average values of the periods of these two series of vibrations are respectively 4.4 seconds and 8 seconds. We may perhaps assume that the 8 seconds' period vibration constitutes the fundamental oscillation proper to the Tokio plain, the 4 seconds' period being one of its harmonics.

The average period of the principal pulsatory oscillations at Osaka, Formosa, Gottingen, and some other places, is either nearly 4 seconds or nearly 8 seconds. It may be that the period (or periods) of the pulsatory oscillations is approximately constant all over the world.

Pulsatory oscillations generally accompany a cyclone; the effect of a great atmospheric depression being sensible at a distance of several thousand kilometres. In a few cases, however, pronounced storms of pulsatory oscillations occur on days when calm weather prevails all over Japan. In Tokio, earthquakes occur rarely while pulsatory oscillations are active. On the other hand, shocks are frequent when these oscillations come to a state of minimum activity.

Periods of Earthquake Vibrations. The predominating periods in the preliminary tremors of the distant earthquake motion observed at Tokio were those of about 4.5 and 8.5 seconds, corresponding thus with the pulsatory oscillation. Moreover the periods observed in the preliminary tremors do not depend on the distance of an epicentrum from the observing station, nor upon the nature of the disturbance at the seismic origin, but they are characteristic of a particular region—in this case Tokio. A similar conclusion probably holds good also for the periods in other stages of the earthquake motion. The conclusion is that the principal vibrations in the preliminary tremors of distant earthquakes and the pulsatory oscillations are identical phenomena.

The explanation is as follows: The waves of the preliminary tremors are transmitted along a deep layer of the earth's crust with a velocity (about 14 km.) of which I shall speak presently, and communicate a stress to the superincumbent surface layer of the earth's crust in the region about the observing station; the latter being, in consequence, thrown into its own proper vibrations. Thus, the preliminary tremors are nothing else than the pulsatory oscillations, caused by the waves transmitted along a deep layer of the earth's crust from the origin of an earthquake.

The Velocities of Propagation of the Vibrations. In calculating the velocities of propagation of distant earthquake waves, it makes a great difference whether we suppose the waves to be propagated along the chord of the earth (joining the origin to the observing station) or parallel to the surface. Calculated on the latter supposition, which seems to be more probable, the velocities of the different waves of the earthquake motion come out approximately the same, irrespective of the arcual distances, those cases, in which the epicentral distance is small, say, under 30°, being excluded. On the chord supposition, the corresponding velocities come out quite different, according to the distances.

If we denote by V_1, V_2, V_3, V_4, V_5, V_6, V_7, and V_8 the velocities of propagation (supposed parallel to the earth's surface) of the waves at the commencement of the successive phases of the earthquake motion, their mean values are as follows:

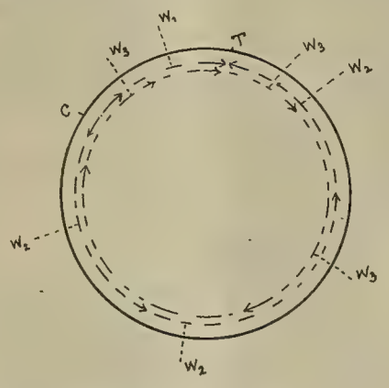
V_1	13.7	km. sec.	V_5	3.3	km. sec.
V_2	7.2	"	V_6	2.8	"
V_3	4.6	"	V_7	2.4	"
V_4	..	"	V_8	2.1	"

Now the velocity of propagation of the vibrations at the commencement of the principal portion of a near earthquake is 3.3 km. (or two miles) per second, which is the same as V_5 above. Here it is evident that the vibrations in the 3rd phase of the principal portion are transmitted along the surface of the earth's crust.

The transit velocity of the vibrations of the 1st preliminary tremor, namely V_1, is very great and no known rock has an elastic modulus sufficiently large to permit of it, whether the vibrations be longitudinal or transverse. Hence we must conclude that the waves of the 1st preliminary tremor are transmitted along some path within the earth's crust. As, however, the duration of the 1st preliminary tremor at a given station is very nearly proportional to the arcual distance between the station and the earthquake origin, it seems likely that the waves of the 1st preliminary tremor are transmitted parallel to the surface of the earth and at a constant depth below it; the supposition being that the waves of the 1st and 2nd preliminary tremors and of the principal portion are all generated simultaneously at the earthquake origin, becoming gradually separated from one another (on account of the difference of the transit velocities) as the disturbance extends. The layer along which the high velocity (V_1) waves are propagated may mark the limit beyond which the seismic waves are, on account of certain physical properties of the underlying medium, unable to penetrate; or there may be, as Professor Nagaoka suggests, a maximum transit velocity. A rough calculation, based on the relation of the duration of the 1st preliminary tremor and the epicentral distance, and on the value of the different velocities, gives 600 kilometres or about 400 miles as the probable depth of the layer along which the vibrations of the 1st preliminary tremor are propagated.

It is probable that the waves having velocities V_2 and V_3 are transmitted along layers at smaller depths within the earth's crust.

Propagation of the Seismic Motion Completely around the Earth. Let T be the observing station and C the earthquake origin. Then there are three sets of motion, which can be distinguished; they may be denoted respectively as W_1, W_2, and W_3.



The W_1 waves are those propagated from C to T along the shortest path, parallel to the surface, namely along the minor arc; the W_2 waves are those propagated from C in the opposite direction and arriving at T after passing through the antipode of C, namely, along the major arc; and the W_3 waves are the W_1 waves which are propagated beyond T in the same direction, and again arrive at T after making one complete circuit of the earth.

The identification of the W_3 waves is possible only in a few cases; that of the W_2 waves is, however, more definite, being characterized by the fact that their period is much slower than those of the preceding vibrations, which form the end portion of the W_1 waves.

The average period of the W_2 waves is, with a few exceptions, uniform and gives a mean value of 20.4 seconds, which is identical with the predominating period in the 3rd phase of the principal portion; the period of the W_3 waves is also nearly the same as that of the W_2 waves. These facts seem to indicate that the W_2 and W_3 waves are the same as those which constitute the 3rd phase of the principal portion of the earthquake proper.

The time interval between the arrival of the W_1 and of the W_3 waves is 3 hr. 20 min. 46 sec.; this agrees with the time that would be taken by the vibrations in the 3rd phase of the principal portion in making one complete circuit around the earth, with the velocity of 3.3 km. or two miles per second.

The San Francisco Earthquake Observed in Tokio. The time of commencement in Tokio of the earthquake was 5 hr. 24 min. 35 sec. a. m. (Pacific time); the total duration of motion being five hours. The duration of the 1st preliminary tremor was 9 min. 49 sec., from which the approximate arcual distance between the origin of the earthquake and the observing place was calculated to be 5,400 miles, and the time of the occurrence at the origin of the shock to be 5 hr. 13 min. 5 sec. a. m. (P. T.).

The 1st displacement of the well-defined horizontal vibration at the commencement of the 2nd preliminary tremor was directed toward S 27° W; the counter displacement being directed toward NE. It will be observed that the directions of these movements correspond to the great circle joining Tokio with the origin of disturbance.

At 7 hr. 31 min. a. m. (P. T.), or 2 hr. 6 min. 35 sec. after the commencement of the disturbance, there began vibrations which correspond to the same earthquake motion propagated along the major arc of the earth, that is, from the center in a southwestern direction, through South America, the Atlantic, and the Indian Oceans.

As other examples of large earthquakes which disturbed the west coast of the American continent, I may mention the following: The Alaska earthquake of September 3 and 10, 1899, and on October 9, 1900; Central American earthquakes, on April 18 and September 22, 1902; Panama, Colombia and Ecuador earthquake, on January 1, 1906.

The whole Pacific coast, which forms one of the most active seismic districts in the world, is frequently visited by earthquakes of different size and intensity. Large destructive earthquakes have, however, a tendency to happen in groups, that is, they occur along different parts of a given zone in the course of a few years. Thus, as mentioned above, there were, between September 1899 and January 1906 a series of six extensive disturbances which affected the whole coast from Alaska down to South America, indicating that these earthquakes were of no local character, but that there was great stress along the Pacific border, such as to lead one to expect the extension of the seismic disturbance to California. The great earthquake of April 18 last may therefore be regarded as having completed the continuity of the manifestation of the seismic activity along this part of the world. Now, the earthquake is caused by the existence of a weak point underground, which, reaching the limit, finally gives rise to a sudden disturbance that becomes the source of the wave motion that is propagated through the rock and the soil. An extensive earthquake such as that of April 18, may be regarded as having removed the instability existing in this part of the earth's crust; those regions most violently shaken becoming seismically the safest place for a certain interval of time. As a matter of fact, there is no case recorded in which great earthquakes have originated successively at one and the same center. The small after-shocks which will continue to shake the western coast for a few years, are not of a dangerous nature. On the contrary, it is absolutely necessary that these small shocks should occur, as they enable the disturbed earth's crust to settle into a condition of equilibrium.*

Iron.—The element iron, as well as the rest of the so-called true metals, is considered as having but one atom to the molecule. If we heat iron, the motion of its atoms becomes greater and greater and their attraction for each other less and less, until, finally, their coherence is so far overcome that the iron melts. In this state the individual particles are able to move freely about one another, but their coherence has not been completely destroyed. When iron is far below the melting-point, a definite amount of heat is necessary to produce a certain rise in temperature for each unit by weight of the iron. This amount is, approximately, the same for each degree of rise in temperature until the iron begins to soften. Above that point, the amount of heat necessary to raise the temperature of the iron one degree becomes greater and greater until the iron melts. This extra amount of heat produces no perceptible rise in temperature. It is absorbed by the iron and becomes, in fact, latent heat. The heat so absorbed serves to give a greater motion to the atoms, and this being converted into motion is no longer perceptible as heat. When the iron solidifies, this motion is again transformed into heat, which prolongs the cooling of the iron. When sufficient heat has been applied to the iron to melt it, it becomes a liquid, and as such is subject to the laws which govern liquids. In a liquid the particles are free to move around and about one another, but their coherence has not been completely overcome. A liquid is capable of dissolving many substances, and iron in a liquid state acts as a solvent, and as such follows the laws governing solutions. It is upon the substances thus dissolved by iron, and existing in it as impurities, that the commercial value of iron depends. There are a number of these dissolved substances, each playing its part in the formation of the varying conditions of commercial iron. The most important, in fact, the all-important, substance is carbon.

Bare copper wire is sold wholesale at an advance of about 1¼c. to 1½c. per lb. over refined copper ingots.

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*(This paper forms the substance of a lecture delivered before the Astronomical Society of the Pacific, at the University of California, on June 9, 1906. Reported and abstracted by the Editor.)

Report of the State Earthquake Commission.

One of the remarkable features of the Coast Ranges of California is a line of peculiar geomorphic expression which extends obliquely across the entire width of the mountainous belt from Mendocino county to Riverside county. The peculiarity of the surface features along this line lies in the fact that they are not due, as nearly all other features of the mountains are, to atmospheric and stream erosion of the uplifted mass which constitutes the mountains, but have been formed by a dislocation of the earth's crust, or rather a series of such dislocations, in time past, with a differential movement of the parts on either side of the plane of rupture. In general this line follows a system of long narrow valleys, or where it passes through wide valleys it lies close to the base of the confining hills, and these have a very straight trend; in some places, however, it passes over mountain ridges, usually at the divide separating the ends of two valleys; it even in some cases goes over a spur or shoulder of a mountain. Along this line are very commonly found abrupt changes in the normal slope of the valley-sides giving rise to what are technically known as scarps. These scarps have the appearance of low precipitous walls which have been usually softened and rounded somewhat by the action of the weather. Small basins or ponds, many having no outlet, and some containing saline water, are of fairly frequent occurrence and they usually lie at the base of the small scarps. Trough-like depressions also occur bounded on both sides by scarps. These troughs and basins can only be explained as due to an actual subsidence of the ground, or to an uplift of the ground on one side or the other, or on both sides. The scarps similarly can only be ascribed to a rupture of the earth with a relative vertical displacement along the rupture plane. Frequently small knolls or sharp little ridges are found to characterize this line and these are bounded on one side by a softened scarp and separated from the normal slope of the valley-side by a line of depression. In many cases these features have been so modified and toned down by atmospheric attack that only the expert eye can recognize their abnormal character; but where their line traverses the more desert parts of the Coast Range, as for example in the Carissa plains, they are well known to the people of the country and the aggregate of the features is commonly referred to as the "earthquake crack."

This line begins on the north at the mouth of Alder creek near Point Arena and extends southeasterly nearly parallel with the coast line to a point about two miles below Fort Ross, a distance of 43 miles. Here it passes outside of the shore line and is again met with at the point where Bodega Head joins the mainland. Thence it appears to continue southward through Tomales bay and Bolinas lagoon. Beyond Bolinas lagoon it passes outside of the Golden Gate and enters the shore again at Mussel Rock, eight miles south of the Cliff House. From this point it is traceable continuously along the valley line occupied by San Andreas and Crystal Springs lakes, past Woodside and Portola, over a saddle back of Black mountain, thence along Stevens Creek canyon, passing to the southwest of Table mountain and Congress Springs to the vicinity of Wrights, on the narrow-gauge railway between San Jose and Santa Cruz. From Wrights it continues on in the same course through the Santa Cruz mountains to the point where the Southern Pacific railway crosses the Pajaro river near Chittenden. From the crossing of the Pajaro the line extends up the valley of the San Benito river, across the eastern portion of Monterey county, and thence follows the northeastern side of the valley of the San Juan river and the Carissa plains to the vicinity of Mt. Pinos, in Ventura county. The line thus traced from Point Arena to Mt. Pinos has a length of 375 miles, is remarkably straight, and cuts obliquely across the entire breadth of the Coast Ranges. To the south of Mt. Pinos the line either bends to the eastward following the general curvature of the ranges or is paralleled by a similar line offset from it en echelon; for similar features are reported at the Tejon pass and traceable thence though less continuously across the Mojave desert to Cajon pass and beyond this to San Jacinto and the southeast border of the Colorado desert. The probability is that there are two such lines, and that the main line traced from Pt. Arena to Mt. Pinos is continued with the same general straight trend past San Fernando and along the base of the remarkably even fault-scarp at the foot of which lies Lake Elsinore. But, leaving the southern extension of the line out of consideration as somewhat debatable, we have a very remarkable physiographic line extending from Pt. Arena to Mt. Pinos which affords every evidence of having been in past time a rift, or line of dislocation, of the earth's crust and of recurrent differential movement along the plane of rupture. The movements which have taken place along this line extend far back into the Quaternary period, as indicated by the major, well-degraded fault-scarps and their associated valleys; but they have also occurred in quite recent times, as is indicated by the minor and still undegraded scarps. Probably every movement on this line produced an earthquake, the severity of which was proportionate to the amount of movement.

The cause of these movements in general terms is that stresses are generated in the earth's crust which accumulate till they exceed the strength of the rocks composing the crust and they find a relief in a sudden rupture. This establishes the plane of dislocation in the first instance, and in future movements the stresses have only to accumulate to the point of overcoming the friction on that plane and any cementation that may have effected in the intervals between movements.

The earthquake of April 18, 1906, was due to one of these movements. The extent of the rift upon which the movement of that date took place is at the time of writing not fully known. It is, however, known from direct field observations that it extends certainly from the mouth of Alder creek near Pt. Arena to the vicinity of San Juan in San Benito county, a distance of about 185 miles. The destruction at Petrolia and Ferndale in Humboldt county indicates that the movement on the rift extended at least as far as Cape Mendocino, though whether the line or rift lies inland or off shore in that region is still a matter of inquiry. Adding the inferred extension of the movement to its observed extent gives us a total length of about three hundred miles. The general trend of this line is about N 35° W, but in Sonoma and Mendocino counties it appears to have a slight concavity to the northeast, and if this curvature be maintained in its path beneath the waters of the Pacific it would pass very close to and possibly inside of capes Gordo and Mendocino. Along the 185 miles of this rift where movement has actually been observed the displacement has been chiefly horizontal on a nearly vertical plane, and the country to the southwest of the rift has moved northwesterly relatively to the country on the northeast of the rift. By this it is not intended to imply that the northeast side was passive and the southwest side active in the movement. Most probably the two sides moved in opposite directions. The evidence of the rupture and of the differential movement along the line of rift is very clear and unequivocal. The surface soil presents a continuous furrow generally several feet wide with

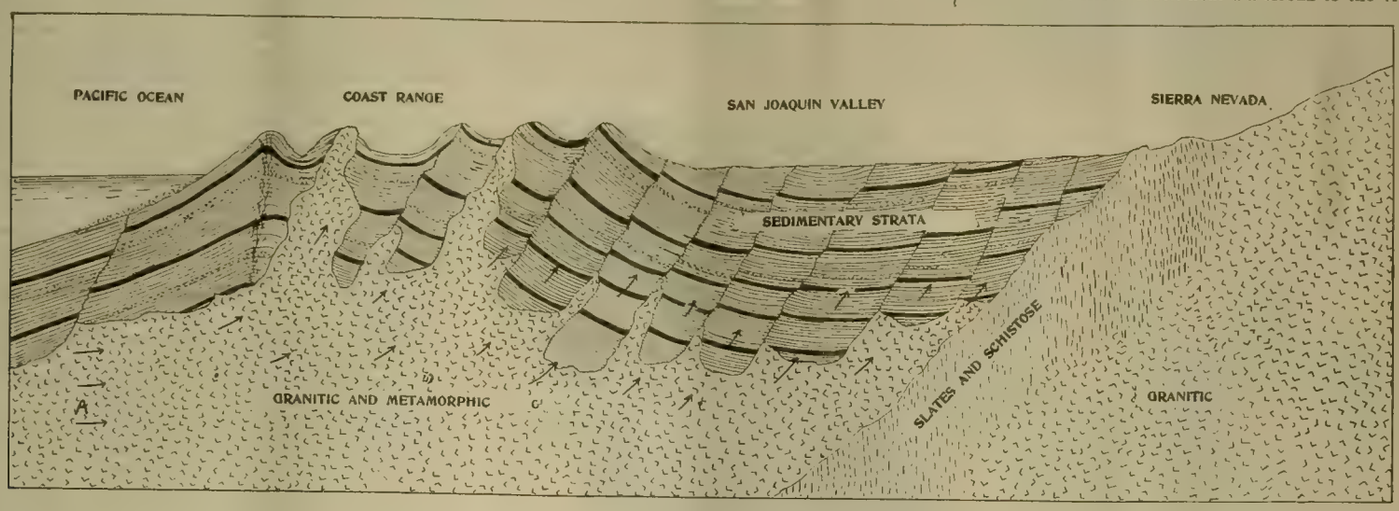


FIG. 1.

FIG. 2.

transverse cracks which show very plainly the effort of tortion within the zone of the movement. All fences, roads, stream-courses, pipe-lines, dams, conduits, and property-lines which cross the rift are dislocated. The amount of dislocation varies. In several instances observed it does not exceed six feet. A more common measurement is eight to ten feet. In some cases as much as 15 or 16 ft. of horizontal displacement has been observed, while in one case a roadway was found to have been differentially moved 20 ft. Probably the mean value for the amount of horizontal displacement along the rift line is about ten feet and the variations from this are due to local causes such as drag of the mantle of soil upon the rocks, or the excessive movement of soft incoherent deposits. Besides this general horizontal displacement of about 10 ft. there is observable in Sonoma and Mendocino counties a differential

FIG. 3.

vertical movement not exceeding four feet, so far as at present known, whereby the southwest side of the rift was raised relatively to the northeast side, so as to present a low scarp facing the northeast. This vertical movement diminishes to the southeast along the rift-line and in San Mateo county it is scarcely, if at all, observable. Still farther south there are suggestions that this movement may have been in the reverse direction, but this needs further field-study.

The great length of the rift upon which movement has occurred makes this earthquake unique. Such length implies great depth of rupture, and the study of the question of depth will, it is believed, contribute much to current geophysical conceptions.

The time of the beginning of the earthquake as recorded in the Observatory at Berkeley was 5 hr. 12 min. 6 sec. a. m., Pacific standard time. The end of the shock was 5 hr. 13 min. 11 sec. a. m., the duration being 1 min. 5 sec. Within an hour of the main shock twelve minor shocks were observed by S. Albrecht of the Observatory and their time accurately noted. Before 6 hr. 52 min. p. m. of the same day thirty-one shocks were noted in addition to the main disturbance. These minor shocks continued for many days after April 18, and in this respect the earthquake accords in behavior with other notable earthquakes in the past. The minor shocks which succeeded the main one are interpreted generally as due to subordinate adjustments of the earth's crust in the tendency to reach equilibrium after the chief movement.

The collection of time records necessarily proceeds slowly. The purpose of the co-seismal curves based upon these records is in general two-fold. In ordinary earthquakes it is one of the means of locating the seat of the disturbance when there is no surface manifestation of the rupture in the earth's crust. In the present instance, however, the rupture has declared itself in an unmistakable rift observable at the surface, and co-seismals are therefore unnecessary for the determination of this important factor in the general problem, so far at least as regards the main disturbance. It is probable, however, that so radical a change in the equilibrium of the stresses of the earth's crust would induce secondary ruptures and consequently secondary earthquakes closely associated with the chief shock. The careful plotting of the time records may, therefore, be useful in revealing the location of these secondary disturbances, such for example as the one which affected southern California on the afternoon of April 18. The second purpose of securing time records is the determination of the velocity of propagation of the earth wave; and the data for this which are likely to be most serviceable are the records obtained at various quite distant seismographic stations.

The destructive effects of the earthquake are in the main distributed with reference to the line of rift. The exact limits of the area of destruction have not yet been mapped, but it is known to extend out about twenty-five or possibly thirty miles on either side of the rift. On the southwest side the greater part of this area to the north of the Golden Gate lies in the Pacific. This area extends from Eureka in Humboldt county to the southern extremity of Fresno county, a distance of about four hundred miles.

Beyond this area of destructive shock the earthquake was felt in its milder manifestations over a wide territory. Our reports to date show that it was felt in Oregon as far north as Coos bay and on the south as far as Los Angeles. To the east it was felt over the greater part of middle California and western Nevada, particularly along the eastern flank of the Sierra Nevada. It was felt at Lovelocks, and we have unconfirmed reports of its having been felt at Winnemucca. Far beyond the region within which it was apparent to the senses, however, the earth wave was propagated both through the earth and around its periphery; and some of the most valuable and most accurate records of the disturbance which we have are those which were registered at such distant seismographic stations as Washington, D. C.; Sitka, Alaska; Potsdam, Germany; and Tokio, Japan.

Within the area of destructive effects approximately 400 by 50 miles in extent the intensity varied greatly. There was a maximum immediately on the rift line. Water-pipes, conduits, and bridges crossing this line were rent asunder. Trees were uprooted and thrown to the ground in large numbers. Some trees were snapped off, leaving their stumps standing, and others were split from the roots up. Buildings and other structures were in general violently thrown and otherwise wrecked, though some escaped with but slight damage. Fissures opened in the earth and closed again, and in one case reported a cow was engulfed. A second line of maximum destruction lies along the floor of the valley system of which the bay of San Francisco is the most notable feature, and particularly in the Santa Rosa and Santa Clara valleys. Santa Rosa, situated twenty miles from the rift, was the most severely shaken town in the State and suffered the greatest disaster relatively to its population and extent. Healdsburg suffered to a nearly similar degree. San Jose, situated thirteen miles, and Agnews, about twelve miles from the rift, are next in order of severity. Stanford University, seven miles from the rift, is probably to be placed in the same category. All of these places are situated on the valley floor and are underlain to a considerable depth by loose or but slightly coherent geological formations, and their position strongly suggests that the earth waves as propagated by such formations are much more destructive than the waves which are propagated by the firmer and highly elastic rocks of the adjoining hill lands. This suggestion is supported by a consideration of the destructive effects exhibited by towns and single buildings along the same valley line which are situated wholly or partly on rock. Petaluma and San Rafael, though nearer the rift than Santa Rosa, suffered notably less, and they are for the most part on, or close to, the rocky surface. The portions of Berkeley and Oakland which are situated on the alluvial slope suffered more than the foothills, where the buildings are founded on rock. The same suggestion is further supported from a consideration of the zone of maximum destructive effect on the southwest side of the rift. This zone lies in the Salinas valley. The intensity of destructive action at Salinas was about the same as at San Jose, and the town is situated on the flood plain deposits of the Salinas river. Along the banks of the Salinas river and extending from Salinas to the vicinity of Gonzales, so far as our reports at present show, the bottom lands were more severely ruptured, fissured and otherwise deformed than in any other portion of the State. The Spreckels sugar mill,

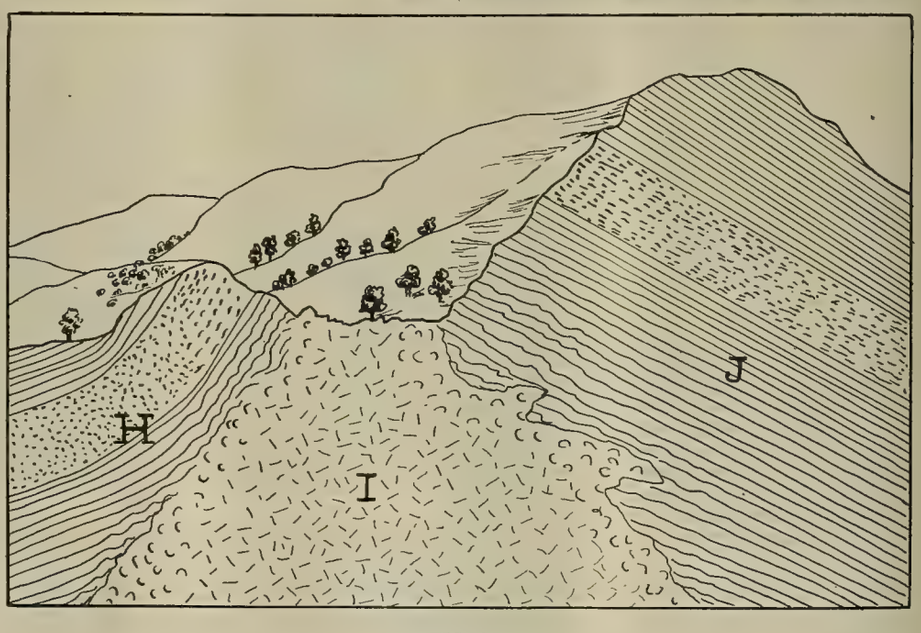


FIG. 4.

situated on the banks of the river, suffered more severely probably than any other steel structure in the State. Santa Cruz, on the other hand, which is on the same side of the rift, and at the same distance from it, but which is built on rock for the most part, suffered much less damage. In the northern counties along the coast the most severe effects were felt at Ferndale, on the south margin of the flood plain of the Eel river, and at Petrolia, on the bottom land of the Mattole. Ft. Bragg was severely shaken with very destructive effects, but our reports do not yet indicate the character of the ground upon which it is situated.

In the facts which have been cited we seem to have warrant for a generalization as to the excessively destructive effect of the earth wave as transmitted by the

little coherent formations of the valley bottoms. But it must be borne in mind that by far the greater number of structures subject to destructive shock are situated in the valley lands, and that there has not yet been time for a detailed comparison of the effects in the valleys with those in the hills, where the buildings are founded on firm rock, except in a few notable instances.

The most instructive of these instances is the city of San Francisco, and the facts observed there are entirely in harmony with the generalization above outlined. In the city of San Francisco we may recognize for preliminary purposes four types of ground: (1) The rocky hill slopes; (2) the valleys between the spurs of the hills which have been filled in slowly by natural processes; (3) the sand dunes; (4) the artificially filled land on the fringe of the city. Throughout the city we have a graded scale of intensity of destructive effects which corresponds closely to the classification of the ground. The most violent destruction of buildings, as everybody knows, was on the made ground. This ground seems to have behaved during the earthquake very much in the same way as jelly in a bowl, or as a semi-liquid material in a tank. The earth waves which pass through the highly elastic rock swiftly with a small amplitude seem in this material to have been transformed into slow undulations of great amplitude which were excessively destructive. The filled-in material and the swampy foundation upon which it rests behaved, in other words, as a mass superimposed upon the earth's surface, rather than as a part of the elastic crust itself. In a less degree the same thing is true of the sand dune areas, where the ground was frequently deformed and fissured. In still less degree the naturally filled valleys between the hill spurs were susceptible to this kind of movement, and the destruction of buildings was correspondingly less, but still severe, depending very largely on the character of the buildings, the integrity of their construction, etc. In portions of these valleys, however, the original surface of the ground has been modified by grading and filling, and on the filled areas the destruction was more thorough than elsewhere in the same valley tracts. On the rocky slopes and ridge tops, where, for the most part, the vibration communicated to buildings was that of the elastic underlying rocks, the destruction was at a minimum. On some of the hills chimneys fell very generally and walls were cracked; on others even the chimneys withstood the shock.

While this correlation of intensity of destructive effect appears to hold as a generalization, there are well known exceptions, which find their explanation in the strength of the structures. Modern class A steel structures with deep foundations appear to have been relatively passive, while the made ground in their immediate vicinity was profoundly disturbed. Thoroughly bonded and well cemented brick structures, on similarly deep and solid foundations, seem to have been equally competent to withstand the shock, except for occasional pier-like walls not well tied to the rest of the building. The weak points in wooden frame structures were in general the faulty underpinning and lack of bracing, and chimneys entirely unadapted to resist such shocks. With these faults corrected, frame buildings of honest construction would suffer little damage beyond cracking of plaster in such a shock as that of April 18, save on the made ground, where deep foundations and large mass appear to be essential for the necessary degree of passivity.

Pipe lines and bridges crossing the rift line present a peculiar, if not quite unique, engineering problem which will doubtless be solved in the near future. Pipe lines on low swampy ground or in made ground are in much greater danger of destruction from earthquake shocks than those on high ground underlaid by rock, except in the immediate vicinity of the rift, where nothing could be constructed which would withstand the violence of the earth movement.

One of the lessons of the earthquake which seems peculiarly impressive is the necessity for studying carefully the site of proposed costly public buildings where large numbers of people are likely to be congregated. In so far as possible, such sites should be selected on slopes upon which sound rock foundation can be reached. It is probably in large measure due to the fact of their having such a rock foundation that the buildings of the State University, at Berkeley, escaped practically uninjured. The construction of such buildings as our public schools demands the most earnest attention of the people and of the authorities charged with their construction. A great many of our schools proved to be of flimsy construction and ill adapted to meet the emergency of an earthquake shock of even less severity than that of April 18.

The Commission in presenting this brief report has had in mind the demand on the part of the people of the State and of the world at large for reliable information as to the essential facts of the earthquake. It has, therefore, not presumed to engage in any discussion of the more abstruse geological questions which the event naturally raises.

The Earthquake Explained.

Written for the MINING AND SCIENTIFIC PRESS by A. S. COOPER.

The coast ranges of California consist of a number of broken anticlines, fissured by faults and step-faults, nearly all of which run in a northwest and southeast direction roughly parallel with each other and with the valleys. Both sides of the fault are elevated but the northeast side is usually raised from one foot to several hundred feet higher than the southwest side.

The dotted and white line on the accompanying relief map shows the location of the master fault of the coast ranges. This fault extends from opposite Fort Bragg, in Mendocino county, to the Gulf of California, a distance of 700 miles. A wagon road follows 400 miles of its length. The movements of the earth which produced the earthquake of April 18, 1906, occurred almost simultaneously in this fault throughout its entire extent; consequently, there was no center of disturbance or seismic focus. The shock was of greater violence near Fort Bragg and San Juan, in San Benito county, than further south. Cracks and fissures can be seen from Tomales bay to San Juan. Two hundred miles of this fault broke into fissures of profound depth in about one minute, as is shown by the duration of the earthquake shock. The land on the northeast side of the cracks and fissures was elevated several feet higher than was the land on the southwest side. The fault marked by a white line on the relief map east of the master fault was also affected simultaneously, fissures opening for a long distance. All of the cities and towns lying within fifteen miles of this fault-line between Fort Bragg and Salinas City were badly damaged.

Fig. 1 is an ideal section from the Sierra Nevada through the San Joaquin valley and the coast ranges to the Pacific ocean in a northeast and southwest direction. As will be seen by reference to this section, all of the anticlines forming the coast ranges are faulted and fissured. The core of some of these anticlines is granitic while others have a core of metamorphic rock. The floor of the valley is also faulted, the fault being hidden by the debris deposited in the valley. These faults and fissures are formed by a mighty pressure coming from the southwest, caused by shrinkage of the earth by secular cooling. The direction of this force is represented by the arrows. This force is deflected upward by the immobility of the base of the Sierra Nevada. The upward deflection of this force is shown by the curved arrows. That this pressure exists is shown by the fissility of the slates and the foliation of the schistose rocks at the foot of the Sierra Nevada. The slates split in a northwest and southeast direction and the foliation of the schistose rocks is also in the same direction. The splitting of the slates and the foliation of the schistose rocks are at right angles to those lines of pressure, such cleavages occurring normally at right angles to the pressure.

Fig. 2, 3, and 4 represent the usual structure of the faulted and fissured anticlines of the coast ranges of California. Fig. 2 is an anticlinal structure which is bent so acutely that its apex is greatly fissured. Fig. 3 is an anticlinal structure faulted and fissured at F; both sides of the fault are elevated, but the side G has been raised from a few feet to several hundred feet higher than the side E. Fig 4 is an anticline having a metamorphic core I. Both sides of the core are elevated, but the side J is generally elevated many hundred feet higher than the side H. There is a faulting at K, between the metamorphic rock I and the sedimentary strata H. The sedimentary strata next to the metamorphic rock are abruptly bent upward by the ascent of the metamorphic rock. The side J is elevated, but usually there is no faulting between the sedimentary rock J and the metamorphic rock. Gases and mineral waters ascend through the fissures and cracks in these anticlines.

The elevation of the strata has progressed several

feet at a time. In the last fifty years in San Benito county the eastern side of the master fault was raised 14 ft., then two and one-half feet, then one foot and then two feet, higher than the western side.

When the lateral pressure described above has increased sufficiently to overcome the weight of the overlying rocks and the friction, the rocks on the side of the fault away from the ocean are suddenly lifted, producing a jar or earthquake. There being a greater pressure when the first movement of the earth occurs, the first shock is always the most violent. This is followed by minor shocks as the earth adjusts itself. A number of years will generally elapse before the lateral pressure increases sufficiently to produce another movement of a similar kind.

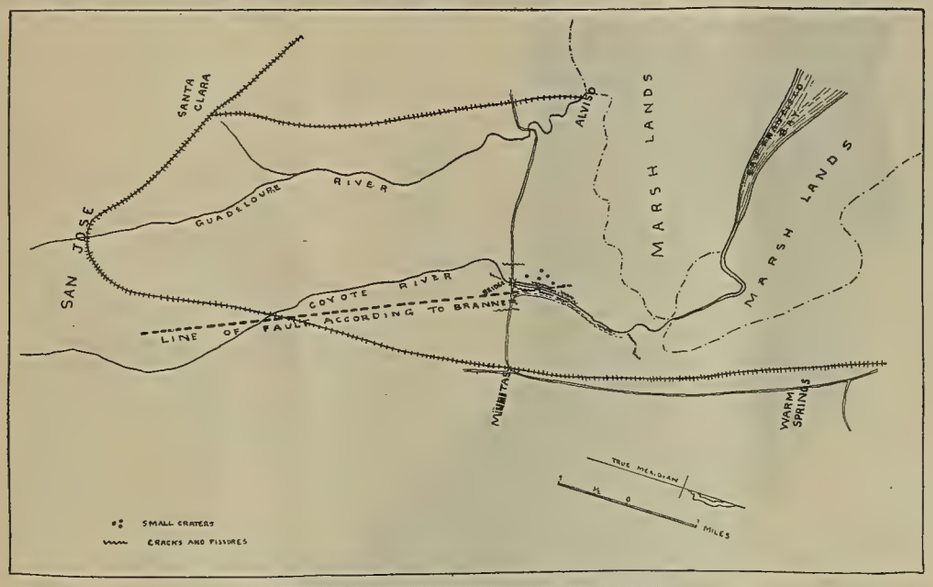
Mining in Honduras.—Consul Felix S. S. Johnson writes from Puerto Cortes, Honduras, to advise Americans not to invest money in mines in Honduras until the Government of that Republic makes roads so that machinery can be easily transported to the mines. He says: "Thus far the mining ventures of American companies in this consular district have mostly been failures. Machinery costing thousands of dollars, owing to poor roads or no roads at all, has in many cases never reached its destination and can today be seen on some trail or bank of a stream, a mass of ruins and rust. The country has no roads and it is a poor policy for persons to think of investing money in mining enterprises in this country until proper means for the conveyance to the interior is provided by the Government. I know of one or two mines in the interior, managed and owned by American companies, which are doing well. These companies have built their own roads to the Pacific coast and employ automobiles in carrying goods from and to the mines."

Remarkable Record of Coal and Ore Roads.—The results of operations in 1905 on the Pittsburg & Lake Erie and the Bessemer & Lake Erie roads are referred to by the 'Railroad Gazette' as little short of marvelous. It says: "When two railroads are able to show average revenue train-load figures, one of 937, the other of 1,076 tons, it is remarkable enough; but when we learn that the average tonnage southbound on one of them is 1,406 tons per train, there is a chance to realize the immense economies of modern methods of handling heavy tonnage. The Bessemer & Lake Erie, which shows this exceptional figure, is largely an ore-carrying road, ore furnishing nearly 6,000,000 of the 9,500,000 total tonnage. As part of the machinery developed by the United States Steel Corporation for transferring Lake Superior iron ores to the Pennsylvania mills, the road shares in the tremendous economics which have been brought about by modern methods of handling and transportation. On the Pittsburg & Lake Erie, on the other hand, coal and coke furnish over 14,000,000 of the nearly 25,000,000 tons, ore amounting to not quite 3,500,000 tons. A large tonnage of manufactured iron and steel products, in addition, helps to make the road nearly twice as heavy an earner on a mileage basis as the Philadelphia & Reading, which has the next largest gross earnings per mile of any American railroad. The fact that the Vanderbilt road is operated at 43.4% of gross for expenses, and the Steel Corporation's line at 48.99% goes to show how profitable railroad operation can be when sufficient traffic is available."

Effects of the Earthquake.

Written for the MINING AND SCIENTIFIC PRESS by D'ARBY WEATHERBE.

For some time previous to the earthquake, John C. Branner, professor of geology in Stanford University, had been examining the topographic and geologic conditions throughout the Santa Clara valley and the adjacent mountains on either side. He came to the conclusion that there existed a zone of fracture or a line of faulting which intersects the Coyote river near the bridge on the road from Milpitas to Alviso. This fault is said to have a course approximately northwest and southeast and some rather remarkable demonstrations of the earthquake have occurred along the levee paths following the Coyote river north from the bridge mentioned. It should be stated in passing that the alluvial deposits of the Santa Clara valley are immensely deep—how deep is not known—although boreholes for artesian wells have been sunk over 1,000 ft. in sand and gravel. At the locality mentioned large fissures, as much as eight feet wide and of nearly equal depth, have been opened and as partial filling ensued immediately, they must have been of much greater depth when first formed. In some places the road has been completely precipitated into the creek and at a point about half a mile below the bridge both the banks and the bed of the stream, including a heavy growth of willows, have been cut by a series of parallel cracks and the trees and banks thrown into the stream, thus forming a partial dam.



SKETCH MAP SHOWING LINE OF FAULT.

All of these cracks are roughly parallel with the stream and approximately with the supposed course of the fracture zone in the rock far below the surface. Simultaneously with the above phenomena, dozens of small geysers or spouting craters were formed along the creek and in the adjacent fields. The mouths of these varied in diameter from three inches to about 15 in., though the actual orifices probably do not exceed four or five inches in diameter. Mud and water were spouted to a height of over twenty feet, and continued to flow for several days. On some of the miniature craters incrustations of salt were deposited. The bridge above-mentioned was shifted on its concrete supports, the two ends moving in opposite directions, and throughout the same locality rows of trees in the orchards are said to have been twisted and staggered out of shape. Above the valley to the east, in the solid rock of the mountains, practically no damage was sustained.

D. Rowan, who accompanied me on the above examinations, spent several days on the Marin side of the Golden Gate, along the Pacific coast, and reports the following effect of the earthquake in that locality: The road crossing the sand-spit at the mouth of Bolinas bay is fissured and in places disturbed, and the high cliffs—about 150 ft.—at the end of the peninsula have crumbled and fallen down, carrying small trees with them. At the village of Bolinas, the soil has slipped down easterly toward the lagoon and on the east side of the road, which runs north and south, the buildings are entirely demolished, while those further up the hill on the west side are not so badly affected. From Bolinas to Olema the road is disturbed all the way. About half a mile west of Olema at Skinner's dairy a well-defined fissure passes north and south under the barn, which is completely wrecked; the garden, lying between the two buildings has slipped down the hill toward the lagoon in a northeast direction, following the slope of the land. It is said that higher up on the hills to the southwest of Olema the effect on the ground was worse and at a point about two miles in this direction an opening occurred in a yard where a cow was being milked, which swallowed up the animal so that its hind legs only were left out of the ground. From Skinner's the road runs north toward Inverness and for a distance of two miles it is so badly broken as to make vehicular traffic impracticable. The road from Inverness to Reyes Point station, running easterly and westerly and between one-half and three-quarters of a mile long, has broken about the center, the western portion being carried north 16 ft.; a block 30 to 40 ft. long has dropped down four feet. At Reyes Point station freight-cars, standing on the siding, were overturned to the west, following the slope of the ground. At Inverness, on the peninsula across Tomales Bay, the buildings along the low ground at the water-front were entirely demolished; in many cases they were thrown into the water and the wharves, being apparently on short piles, were badly wrecked. Higher up on the hill, the motion was not felt to such an extent. Along the coast, the railway was greatly disturbed, invariably sinking in the low swampy land except where built on piling. At Tomales, about eight miles inland, the line for over 1,000 ft. was carried down a gentle slope to the east for a distance of 50 ft. All these disturbances are exactly along the faulted line, now well defined, though the movement and action in each of the cases above noted has been entirely local and following the configuration of the ground. Little evidence, therefore, can be deduced pointing to a definite regional movement in any certain direction. Buildings on ground resting on long piles seem undisturbed and the worst effects are noted on or toward swampy ground.

Chromite. The only important ore forming the raw material for the manufacture of chrome and its ferro-alloys is chromite, FeO Cr_2O_3, containing 68% chromic oxide. Often, the ferrous oxide is replaced by magnesia and the chromic oxide and alumina, and it generally contains variable quantities of silica. The total yearly output from all sources is 70,000 tons, the greater portion of which is employed for the manufacture of chromates, bichromates and refractory furnace linings. Ores for the production of ferro-chrome should be as pure as possible and free from silica, as the latter element has a tendency to enter into the alloy instead of going into the slag, when smelted in the electric furnace. A suitable ore should contain at least 50% of chromic oxide.

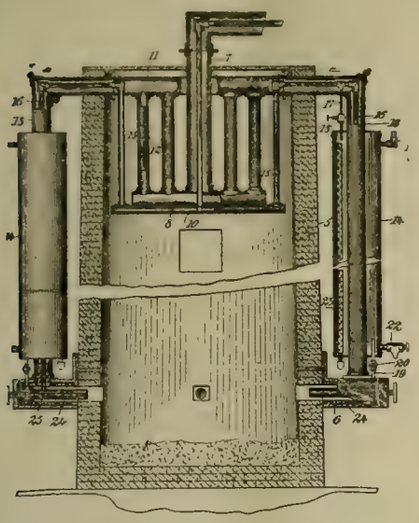
The Yukon.—From being a "graveyard of navigators" the upper Yukon river has become practically as safe as a canal. During the open season steamers, barges, scows, canoes in great numbers ply its waters, and accidents of any description are extremely rare. The Yukon forms a convenient highway through the central portions of this great Northwest. Its traffic is divided between the White Pass and Yukon route (railroad and steamers) from Skagway to Dawson, and the American route from Seattle to Dawson via St. Michael. Generally speaking, Yukon Territory and the Forty Mile district in Alaska are served by the Canadian route, while the American route supplies the wants of the lower river points, including the Tanana, Koyukuk, and Rampart mining district. Fairbanks alone, during the present winter, required as large stores of provisions as Dawson. In its solicitude for the welfare of Yukon Territory the Canadian government has annually voted grants, not only for the construction and maintenance of roads and trails—about $200,000 for the fiscal year ending June 30, 1905, or $1,386,400 altogether from 1899 to January 31, 1906—but also for the improvement of the Yukon river and its tributaries. The program for the current year provides for an expenditure of $15,000, to be distributed as follows: $8,000 for rock blasting at Hell's Gate, $1,500 for the Fortymile river, $3,000 for the upper Yukon reaches, including Thirtymile river, and $4,000 not yet placed. Since the opening up of this country a few years ago Canada has appropriated about $175,000 for Yukon river improvements. On the American side of the line, in Alaska, improvements have not even started. The Yukon flats are still there to endanger and retard American shipping, and so are the obstructions at the mouth of the river, which were fully described and explained to the senatorial subcommittee who personally, in 1903, investigated conditions in Alaska. It should be thoroughly understood, in this relation, that transportation is the chief problem in this wonderful northland. It is the paramount question in the development of Alaska.

Mining and Metallurgical Patents.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

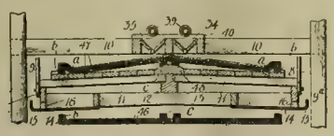
CUPOLA, No. 820,210. J. H. Koons, Delphos, Ohio.

The combination with a cupola and twyer-boxes communicating therewith, of a heater comprising low-pressure pipes arranged in the cupola and communicating with the twyer-boxes, high-pressure air-pipes arranged in the heater and communicating with the twyer-boxes, oil-tanks communicating with the twyer-boxes, and means for heating the oil therein.



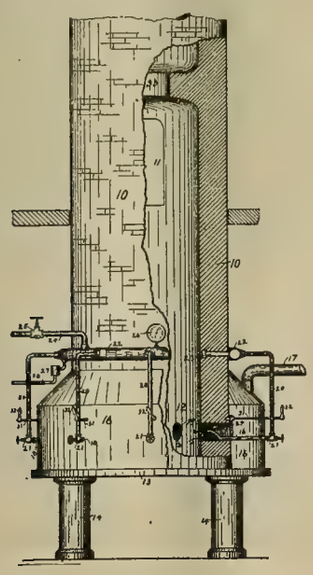
ORE-SLIMER, No. 820,234. I. F. Monell, Boulder, Colo.

In a machine of the character described, an endless apron or belt having its upper stretch inclined from its longitudinal center outwardly, strips secured underneath the edges of said apron to form pockets along the upper edges of said apron, strips secured underneath the longitudinal center of said apron, in combination with oppositely-tapered rollers over which said belt travels, an oppositely-inclined flooring having an elevated crown-strip, over which the center strips of the belt pass, and means for discharging pulp upon the opposite sides of the longitudinal center of the belt.



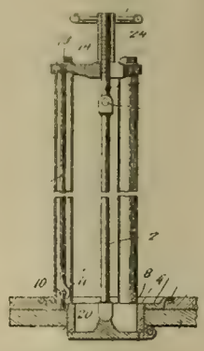
CUPOLA, No. 820,167. Winfield S. Anderson, Cincinnati, Ohio.

In a cupola or similar device fitted for using liquid fuel, the combination of a working chamber, a fuel-heating pipe arranged around the wall which surrounds this working chamber and provided with communicating, inwardly-projecting heating-spurs which are embedded into this wall so as to derive heat therefrom, means to supply a hydrocarbon to this pipe and its spurs so as to be preheated therein, burner-nozzles arranged to discharge into the working chamber and feed-pipes connecting them with the fuel-heating pipe.



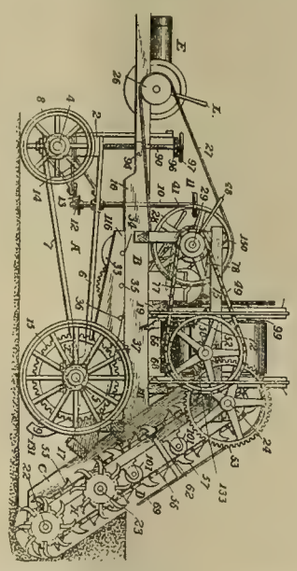
CYANIDE-TANK GATE, No. 820,116. John Ike, Deadwood, S. D.

In a device of the class described, a pair of spaced bearing-heads, one of said heads having a slot, and the other being provided with a tubular extension constituting a seat, tie elements operatively engaged with and for connecting said heads, a gate pivoted to the tubular extension and adapted to close on the seat, a stem operatively connected with the gate and designed for entrance into said slot, and a hand-wheel having a tubular hub threaded onto the stem and designed for engagement with the adjacent bearing-head.



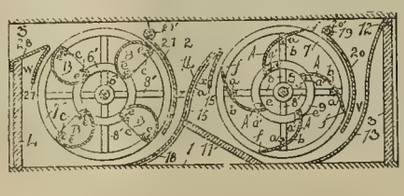
EXCAVATING AND DITCHING MACHINE, No. 820,152. James K. Sweeny, Pueblo, Colo.

The combination in an excavating apparatus, of a frame, wheels supporting the same, and a second frame extending over the first and supporting the working parts and pivoted on the front axle of the running-gear frame to permit the forward end of the supporting-frame to be raised and lowered, the pivotal point being about midway of the weight of the frame and apparatus.



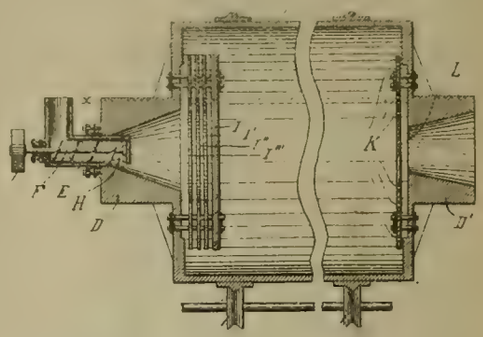
AMALGAMATOR, No. 820,189. Charles E. Gard, Ord and John W. Lynn, Omaha, Neb.

A housing provided with an intake-opening and an exit-opening, a curved end plate secured near the intake-opening of said housing, a curved guard-plate placed adjacent to said end plate to form a channel, a shaft passing transversely through said housing, a plurality of perforated agitating-knives secured to said shaft and rotating adjacent to the end of said channel, a curved partition provided with a downwardly-extending apron, a second curved guard-plate positioned adjacent said partition to form a second channel, a second shaft passing through said housing, a plurality of troughs secured to said shaft, said troughs having opposite edges recurved, an inclined tail-plate secured adjacent the exit-opening within said housing provided with a downwardly-extending apron, and means to operate said shafts.



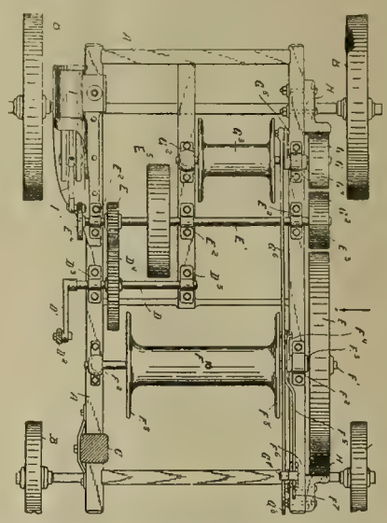
PEBBLE-MILL, No. 820,559. George S. Emerick, Philadelphia, Pa.

The combination in a ball-mill of a feed mechanism therefor, consisting of a non-perforated plate or disk and a ring-shaped plate or disk spaced between the said non-perforated plate and the feed end of the mill-cylinder, said non-perforated plate and ring-shaped plate being parallel each to each.



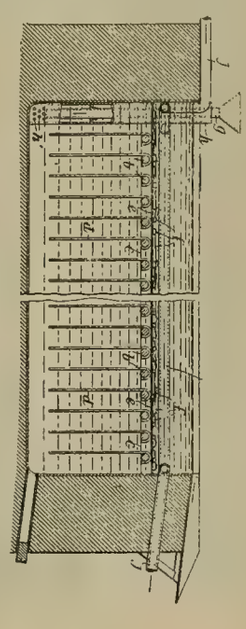
WELL-DRILLING MACHINE, No. 820,936. Claude M. McAfee, Waco, Tex.

In a well-drilling machine, the combination with an engine-shaft, of a walking-beam shaft directly connected to the engine-shaft, a bull-wheel shaft directly connected to the engine-shaft, and a sand-reel shaft directly connected to the engine-shaft.



RECOVERY OF COPPER FROM SOLUTIONS CONTAINING IT, No. 820,555. Benvenuto Comba, Turin, Italy.

The method of recovering copper from solutions containing it, which consists in placing the solution in a suitable vessel, immersing a cathode therein, superimposing a liquid of less specific gravity upon the surface of the copper solution, and supporting an anode in said supernatant liquid, in direct contact with the cathode, whereby an electric current is generated and pure copper is deposited upon the cathode.



MINING SUMMARY

ARIZONA.

COCHISE COUNTY.

E. E. Cochreham during May did 100 ft. of work in 21 days, in an incline, on the property of the Paradise Development Co. The shaft is now down to a depth of 225 ft. When 250 ft. shall have been reached, S. S. Badger, the owner, intends to cross-cut the formation. Both water and ore were struck in the incline at 225 ft. where there are two feet of sulphide copper ore. It has been decided to sink 350 ft. before drifting. A steam-hoist is planned, and should water become troublesome, a steam-pump will be installed.

GRAHAM COUNTY.

(Special Correspondence).—John Molder, owner of the Buzzard Shadow claims in Coronado Mountain district, shipped a ton of ore from the claims to the El Paso smelter last week, which will run $100 to $125 per ton. He is expecting to make another shipment in about ten days.——It is reported in this district that the Lampazos mine and smelter have been purchased by the Phelps Dodge Co., through J. S. Douglas, of the Montezuma Copper Co. at Nacozari. The mine and smelter are the property of M. A. Lopez of Lampazos. He has been operating for the last four years, and is the largest producer of the metal south of Nacozari. ——E. U. Beauchamp, manager of the Gold Belt Development & Reduction Co., passed through Morenci on his way to Clifton recently. He has had fourteen men working on his property for the past three years. The new hoist has arrived in Clifton, and will be taken to the mine over the wagon road just completed. The lead claims of the company are being put in condition for shipment of ore to the smelter at El Paso. ——The annual meeting of the Home Copper Co. directors was held in Morenci on May 28, and new officers were elected. The shaft now being sunk will be continued and the force increased. The new officers are H. J. Degenar, president; W. A. Leonard, vice president; W. P. Gee, secretary and treasurer; John Burns, T. F. McClellan, James Bartlett, Paul Becker, H. J. Degenar, W. A. Leonard and N. L. Jenkins, directors. N. L. Jenkins, who has been in charge of the work for the past two years, has been retained as superintendent and general manager. The Home Copper Co. was organized several years ago, but no systematic work was done until within the last two years. A new wagon road connects the claims with Morenci.——The recent reports from the Ash Peak district in this county are of interest. The Ash Peak Mining Co. of Boston, owns property situated eleven miles north of Duncan in this county. It is under the management of A. Murphy, Jr. There is now 1,100 ft. of work done on the property. The assays of the ore taken from a 40-ft. shaft return 800 oz. silver, besides gold. The shaft will be continued to a connection with the tunnel, and a mill will be erected. The ore is 90% silica, and it is thought it can be cyanided.

The Allen gold mine, below Newtown, has been closed down for the summer. Some rich ore has been taken from this mine during the past few months, the first shipment of a carload netting $4,350. Another shipment was made last week.——On April 21, the millmen at the Detroit Copper Mining Co. concentrator signed a petition requesting the granting of an eight-hour day. The company offered the men the choice of continuing on the basis of twelve hours as in the past with the same rate, or reducing the day to eight hours with a cut of fifty cents per man per day. The men refused to accept either of these propositions and sent word to the superintendent that they would stay at work under the present scale until May 1. In consequence, on that date, the foreman of the concentrator received word to shut down the mill. The men received their pay and nearly all left camp within a few days. A large proportion of the men has been in the employ of this company for a number of years, and were reluctant to leave. The mill was closed down for ten days, the ten-hour repair men being the only force working. Last week a force sufficient for operation was recruited, but most of the men are new to the work and the service and output are unsatisfactory as yet.——On Friday, June 1, the millmen of the Arizona Copper Co. concentrator No. 5, followed the example of the Detroit Co. men, under the same conditions. This mill is still idle. It is expected that similar demands will be made at the mill of the Shannon Copper Co.——On May 1, the Arizona Copper Co. voluntarily made the concession to their force of carpenters, of Saturday afternoons and Sunday as overtime, with a rate of time and a half. Learning of this, the Detroit Copper Co. carpenters, engaged in the erection of a new mill, asked for the same scale, and it being refused, they struck, and as a consequence that part of the work is also at a standstill.——The Detroit Copper Co. is laying a new ten-inch pipe-line from the double hill tanks to connect with, and furnish water to the new concentrator. A new location was found which necessitated pumping, the new line being laid so that the water will flow entirely by gravity.

Morenci, June 9.

MOHAVE COUNTY.

It is reported that the heat has been so great in the Bill Williams Fork country the past month that numerous mines have been closed down for the summer.—— A mill of 100 tons' daily capacity is to be placed in the Cupel mine at Stockton hill, by W. H. Cushing.—The lessees of the Little Chief mine at Stockton hill are breaking eight inches of very rich silver-gold ore, which they are shipping. The mines of this camp are frequently rich in wire and ruby silver.—The Arizona-Minnesota Gold Mining Co., it is reported, will rebuild the O. K. mill, or build a mill at the mine, thus dispensing with the long haul between mine and mill. The Eldorado mine was in good ore at the time of the shutdown, caused by the destruction of the mill by fire.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence.)—It is reported that the Keystone mine, one of the largest and oldest gold mines of the State, has been sold to the Bagdad-Chase Mining Co. of New York, for $1,000,000, of which $250,000 are said to have been paid. The Keystone mine is about 1,600 ft. deep, but the greater part of the development, consisting of upward of 10 miles of workings, is above the 900 level. The equipment consists of hoist and 60-stamp mill, motive power being furnished by electricity and compressed air. The Bagdad-Chase Co. is also operating the Soulsby mine at Soulsbyville, in Tuolumne county, under bond.

Sutter Creek, June 10.

BUTTE COUNTY.

It is reported that a gold strike has been made in the vicinity of Pentz, in a gravel mine on Dogtown ridge six miles north of Cherokee, by Hendrix brothers of Oroville, and G. M. Reaves of Magalia. The past two years they have been driving a tunnel, and finally encountered the channel with a pay-streak running $5 gold per cu. yd. The Blue Hog Ranch mine is believed to be an upper extension, and the strike will probably result in the Blue Hog resuming operations.

A new strike has been made by M. J. Cooney, at Oroville, not far from the Spring Valley mine at Cherokee. Mr. Cooney made two locations on the vein, which he found outcropping 30 ft. wide. Accompanying it on the hanging wall is another vein six feet wide. At the contact is a pay-streak of high-grade ore. The quartz all pans free gold. The vein has been traced for 1,000 ft. on the surface. A pick had never been stuck into it before Mr. Cooney located it.

COLUSA COUNTY.

The strike of quarrymen employed by the Colusa Sandstone Co. and the McGilvray Stone Co. at Sites has been settled and the men have returned to work. The terms on which the strike was settled have not been made public.

NEVADA COUNTY.

Pay gravel is reported struck at the Jenny Lind mine near Nevada City. The mine was first worked as a quartz mine, but failing to develop anything, a large gravel bank was prospected and proved encouraging. A great deal of work has been done, and now the channel has been opened. It is supposed to be the continuation of what is known as the Alta channel, which was worked years ago.——A 700-ft. tunnel has been run to connect with the shaft on Iron Mountain west of Grass Valley. The shaft is down 165 ft. It is believed a body of copper ore will be developed.

SAN BERNARDINO COUNTY.

A copper strike was recently made six miles west of Soda lake, by M. T. Amos, J. C. Amos and Charles Gray. The main vein is from one to ten feet wide, and assays run as high as $125 copper and gold, of which from 12 to 20% is copper. The locators have staked out 31 claims in two groups. Two tunnels of 1,000 ft. each have been run, which will give 600 and 1,000 ft. respectively, of backs. The mine was worked 30 years ago for silver, but was abandoned.—The Sunrise district is 20 miles south of Needles, the settlement being called Cluresville. The first strike was made in February, 1905, on the Blue Bird. Then the Dollar mine was struck by McClure and his partner. It was on the surface, but they shipped some of the ore to a smelter and none of it ran less than $100 per ton, and some of it ran $1,000. The property was bought by the Woods Investment Co. of Los Angeles, which owns 40 claims in the district.—Among the Eagle mountains, six miles north of the McClure mines, is the Big Four, now under bond to Mr. Graham, of Douglas, Arizona. The vein is 20 ft. wide and some of it is rich. The owners are sacking ore, which carries gold and copper. In the vicinity are also lead-silver deposits.

SHASTA COUNTY.

At the new smelter camp of Coram, four miles south of Kennett, 100 men are employed grading on the smelter site and on the Southern Pacific railway spur, and also on the six-mile wagon road to the Balaklala mine. An additional force of 200 men is expected any day to rush the work on the spur, which leads from the main track to the smelter, and which will be about a mile and a half long.

TEHAMA COUNTY.

The California & Massachusetts Copper Mines Co. has bought a number of claims on and near Tom's Head mountain. About 340 acres of mineral ground are covered by the transaction. The company will begin development work on three of the prospects, and a mining district will be organized to be known as the Red Bluff mining district.

TULARE COUNTY.

Robt. Johnston of Visalia, intends to open up another granite quarry on South Tule. He is now employing six men.

COLORADO.

BOULDER COUNTY.

A dozen lessees on the American Star mine, on Left-hand creek, are greatly chagrined because last week they served notice of the surrender of their lease, as it did not pay. L. R. Johnson, of Boulder, manager of the company, notified the company at Hartford, Conn., and received instructions to make other arrangements. Meanwhile the lessees sent down a carload of 30 tons, which ran high enough to give each lessee $10 per day for all the time he had put in for six weeks. They notified Johnson that they had probably made a mistake. He agreed with them, but declared it too late for renewal, and the company will develop the strike on its own account.

GILPIN COUNTY.

The O. K. property on German hill in the Gregory district, southeast of Central City, has been sold to A. H. Frost of San Diego, Cal., and J. R. Hastings of Chicago, Ill. The main shaft of the O. K. mine is down over 600 ft. and during the past year the property has been extensively developed by Anderson & Co., and a number of lessees have been at work. Shipments of concentrating and smelting ore have been made, large orebodies have been exposed, and the property is reported to be in shape for heavy and regular production. The new owners have arranged to have the main shaft repaired and the force is to be increased as soon as active operations are in full swing. C. H. Karns of Central City is superintendent.

GUNNISON COUNTY.

A $10,000 electric light and power plant is proposed by the Taylor Park Mining Co. for the Enterprise mine. The Enterprise mill is idle while repairs are being made.——Chas. Hubbard has been steadily taking out ore from the X-10-U-8. He is sacking the best and stacking all below $40. It is the intention to take this ore out via Cement creek. W. W. Roof is working the Black Warrior through the Hubbard tunnel. He has found some rich ore, and has made a raise to connect with the shaft on original workings of the Warrior. ——At the Forest Hill mine machinery is being brought down from the old workings to the new shaft.——At Pie Plant mén are working steadily, and the Doctor mine has ore ready to ship. The high price of silver and lead is putting life into the mines of Italian mountain.——Howard Marshall has worked for the Enterprise mine all winter, keeping open the Taylor trail. For the last two months the teams have started every morning at three o'clock to make the pass when snow was crusted and before slides began to run. A dozen slides have come down, but always after the teams were safely over with their ore wagons and supplies.

LAS ANIMAS COUNTY.

Manuel Martinez, a Mexican coal mine worker, has been arrested, charged with having set fire to the Engleville coal mine owned by the Colorado Fuel & Iron Co. Martinez was discharged from the mine three weeks ago and the next day the property began to burn. Hundreds of miners were imperiled, many of them being saved with difficulty. The fire is reported to be still burning fiercely. The loss is estimated at over $100,000.

SUMMIT COUNTY.

(Special Correspondence).—The Old Union has made

a rich strike in the bottom level where the breast of the main tunnel shows four feet of zinc ore of shipping grade. Beside this is a body of concentrating ore which is being milled. The 150-ton mill is running full time, producing high-grade lead and zinc concentrate. It is equipped with ten Wilfley tables.——The Wellington mine is making large and regular shipments of lead and zinc ore.——The Country Boy lessees have now the finest body of zinc ore in the district and are shipping black sulphides which run 50% zinc in car-load lots, just as taken from the vein. They are also piling up a large tonnage of low-grade ore to be treated at their own mill.——The Bullion King mine is shipping high-grade lead-zinc ore containing silver with some gold.——The Atlantic mine on North Star mountain is increasing its force and will resume shipment in the course of a week. The roads have been too bad of late for hauling and in consequence a large supply of ore is on hand awaiting shipment. The vein producing this ore is from 15 to 20 ft. wide. It averages three to five ounces gold per ton.——The Dunkin mine worked by lessees is in the shipping list and producing well.——The Jessie mine has its 40-stamp mill running, and the ore in the bins is high grade. A strike of $500 ore was recently made in this property. ——H. W. Spaulding has been appointed superintendent of the Mekka Placer Gold Mining Co., operating in French gulch. Hydraulicking is now in full swing and the ground of the old Oro Co. will soon be washed.——J. C. Putner, of Denver, is in charge of the renewed operations on the Wire Ranch mine on Farncomb hill. He has men opening up the orebodies, and mechanics are putting the mill in order.——The Sallie Barber mine on Nigger hill, has been working on a high-grade zinc vein for some months past and making large shipments. This vein has now opened up to nine feet of solid zinc-blende.——The Abundance Mining & Milling Co. started the diamond drill in operation in Yuba Dam Flats today; they being at a depth of 120 ft., at which point the churn-drill was stopped on account of the solid rock being encountered. In the operation of the churn-drill a body of over 40 ft. of low-grade ore was passed through. This would pay to handle with a big mill on the property.

Breckenridge, June 9.

TELLER COUNTY.

On the Isabella property, in Cripple Creek district, thirty sets of lessees are working, and their work, together with that of the company during the month of May, produced 60 cars of ore which was the average value of $30 per ton, making a total of $45,000. The company work is confined to development in both the Lee shaft on the Isabella and the main workings on the Empire State. Only one lease has so far been granted on this portion of the estate.

OURAY COUNTY.

The Ouray City Mining Co. has begun diamond-drilling operations in the southeast part of Ouray. Two shifts are being worked at present, and they are going down at the rate of 25 ft. per day. It is thought that if the formation is not too badly broken they will cut four contacts within 300 ft. of the surface.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—It is announced that a company is about to be formed for mining in the Coeur d'Alene, and that the company will be one of the biggest mining corporations in the West, with W. A. Clark of Montana, as chief stockholder, with Bracking and Ebbley of Wallace, George W. Winters, of Butte, and Joseph Pyle among the stockholders. The intent of the proposed corporation is to drive a tunnel, beginning on the claim known as the Phoenix No. 7, near Burke, and extend it until it taps the Hercules vein at a depth of 1,250 ft., 600 ft. below its present greatest depth, and to extend it to a total length of four miles, and cut the Tamarack and Chesapeake lode at a depth of 1,500 ft. below the 1,600-ft. level.—— A. Page of Wardner has paid $19,000 cash for D. McEachran's interest in four claims on Government gulch. Page and Dedlin own a majority of the stock of the United States Co., joining the Bunker Hill on the east, the Silver Creek group of three claims, the Black Hawk and Wyoming mines west of the Federal and Bunker Hill Co.s' holdings, and the Western group of 107 claims extending west from them almost to Pine creek. Mr. Page also closed a deal on a six months' bond for John Corrigan of Silver creek on claims three miles west of Wardner, adjoining the Western group.——The Coeur d'Alene Consolidated Mining Co. has been incorporated by Spokane and Coeur d'Alene people, and will develop a group of silver-lead claims near Osborn. ——Chas. Sweeney of Spokane, president of the Federal Mining & Smelting Co., reports a strike on the Tiger-Poorman of six feet of ore, of which a third is galena carrying 55 to 60% lead, and four feet of concentrating ore that runs 10% lead. This was found at the 2000-ft. level——The Federal Co. is putting in, at its Morning mine at Mullan, a plant to treat 325 tons of tailing daily. The Bunker Hill & Sullivan Co. has ordered a concentrating plant to treat its entire tailing dump.——The Hecla Co. has paid its 35th dividend of $20,000, making a total of $680,000 paid in dividends, of which $240,000 were paid last year.——W. A. Boyd of the Coeur d'Alene Concentrating Co. has returned from New York, where he contracted for $10,000 worth of machinery to be used on the company's property near Wallace.

Wallace, June 9.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—The Quartette Co. has installed a new 100 h.p. gasoline engine, which is to furnish power for the electric light plant, compressor and electrical pump.——A shipment of ore made by Stoner to the Phoenix, Ariz., smelter, consisting of 2100 lb., netted $288 after freight and treatment charges were deducted. Steady shipments will be made.—— The Nevada-Searchlight has struck a good shoot of ore in the Grand Central claim and sinking to water level, which should be encountered at 200 ft., will be continued.——It is reported that the Southwestern Co.'s entire property is under option. This company has extensive holdings in El Dorado canyon and in the surrounding country. W. A. Clark is said to be the purchaser.——The Searchlight Bonanza Co. has put in a gasoline hoist and is making surface improvements.

Searchlight, June 8.

NYE COUNTY.

(Special Correspondence.)—The offices of the Vegas & Bullfrog railroad are now at Johnnie siding, 12 miles north of this place, and the auto road to that point is completed. The auto makes the trip over and return daily from here—formerly two days by stage from Ivanpah or Good Springs siding. Prospectors are coming and mine owners are taking out ore for shipment. ——At the Johnnie Consolidated they are sacking ore from the grass roots that assays $1,000 per ton. This is free-milling gold ore. Parties with wagons, and prospecting outfits well prepared for good serviceable work, as well as burro outfits, are becoming plentiful. This season the fruit crop at ranches in this part of the State will be immense. Our whole country in southwestern Nevada is coming to the front and only requires money for development, for the mines are here.

Johnnie, June 9.

On the third level of the Denver, at Rhyolite, an orebody 300 ft. long has been opened. The level has shown values from the beginning, but came into the rich ore at the junction with the winze. The vertical depth is 300 ft., which has been gained after driving 570 ft. The second winze from the third level, 200 ft. beyond the first, is down 35 ft., and continues to show good ore.

It is reported that a movement has been started to consolidate the Tonopah Mining Co., the Tonopah-Extension, Tonopah-Belmont, Montana-Tonopah, the Midway and the Jim Butler mines at Tonopah. The only producing mines of the camp not included in the consolidation being the West End, McNamara, and North Star.——A report is also being circulated to the effect that eight feet of ore assaying $75 per ton has been cut in the McNamara, on the 300-ft. level, at 100 ft. from the end line of the West End.

NEW MEXICO.

GRANT COUNTY.

The Burro Mountain mining district is 15 miles southwest of Silver City. Although it was discovered at an early date in the history of mining in New Mexico, it really is a new camp, and it is only recently that capital has become interested in the mines. It is a district of low-grade copper ore, and also produces turquoise. The Comanche Mining & Smelter Co. is interested in the camp, and expects to continue the narrow-gauge railroad, which is built from Pinos Altos to Silver City, down to the Burro comp.—The Comanche Co. and the Burro Mountain Copper Co. are the principal owners in the camp. The first-mentioned company has claims which are mainly in the body and adjoin the holdings of the Burro Mountain Copper Co. Developments have been carried on in this property through three shafts sunk on different veins running parallel. The ore is mainly low-grade carbonate.—The Burro Mountain Copper Co. has 600 acres of ground in which the quality of the ore and the size of the veins are about the same as in those of the Comanche Co. The Burro company works a large force of men. It has 5,000 ft. of work done on the property. The ore is treated in the company's concentrating mill, which has 250 tons daily capacity. The concentrate is freighted to Silver City for treatment at the smelter. The town of Leopold, of about 800 people, has grown up since the Burro Mountain Copper Co. began work. They have electric lights and are supplied with an abundance of fresh water from Deadman's canyon. Among other companies carrying on development in the district are the Copper Gulf Mining Co., the Tip Top Mining Co. and the Alessandro Copper Co.

OREGON.

JACKSON COUNTY.

C. W. Evans has been investigating the possible production of silicious ore in the mining district adjacent to Ashland; this material is required as flux for the copper ore being treated by the smelter of the Mammoth Copper Co. from their own mine. The transportation rates from Ashland to the Kennett smelter on that class of ore is $2.40 per ton in carload lots. The smelter makes no charge for treating this silicious ore and pays 75% of all the values contained, and cash is paid for the ore within forty-eight hours after it arrives at the smelter. Shipments as small as 10-ton lots are received. The cost of mining is from 50c. to $2 per ton, according to the hardness of the material and the facilities for mining. The cost of hauling a distance of five miles to the railroad is $1 per ton. This makes it possible to realize a fair profit on low-grade ore. The Kennett smelter is owned and operated by the Mammoth Copper Mining Co., and has a capacity of 1,000 tons per day and the plant is being enlarged to double that capacity.

WASHINGTON.

(Special Correspondence).—The Spokane Mining Exchange has been reorganized and is again working under the rules which formerly governed it. Activity in stocks is stronger now than for several years, and brokers report good business. The exchange meets at 11 o'clock each morning in a private office, but if it continues to be popular, better quarters will be secured.——The stockholders' meeting of the Tamarack and Chesapeake Co. was held in Spokane Saturday, June 2, and an adjournment taken for one month. There is a fight for control between R. Day and H. B. Brien. The latter is president and manager of the company. The Day crowd contends that Brien has not managed the property well, although carload shipments were made which returned 70% lead and 50 oz. silver per ton.——Patrick Clark, president of the Furnace Creek Copper Co., has returned from New York to Spokane, and says construction of a 200-ton smelter at the company's property in Death Valley, Cal., will be commenced this fall. John W. Gates is said to have recently purchased a large interest.——The Spokane Petroleum Co. is boring for oil near Lubec, Mont., and expects to strike oil within 500 ft. of the surface. The company is composed chiefly of Spokane men; Chas. Garber is president.——Jay P. Graves has lately acquired a controlling interest in the Holden mine in the Chelan district, Washington, and he and N. G. Blalock of Walla Walla have secured water power on Chelan river, and it is said will develop this power, build an electric line from Chelan to Spokane, and equip the mine. It is claimed 100 miners will be employed.—— The Oro Plata Mining & Development Co. held its annual meeting in Spokane recently and elected G. W. Simpkins president and general manager; G. H. House, first vice president; M. N. McLeod, second vice president and secretary, and C. K. Laurence, treasurer. The property is 25 miles from Butte, Mont., and lies on both sides of the Copper Chief, which is undergoing development.——The annual meeting of the Albion Mining Co. was held in Spokane June 2, and Thos. Hooker chosen president. This property is at Ainsworth, B. C., and has lain idle for a number of years. Recently the company made a contract with the Black Diamond Tunnel Co., and the Highlander Co. to construct a cross-cut tunnel from their lower level to the south line of the Albion, a distance of 230 ft., thus allowing the Albion the right to cross the Highlander property and use the latter's tunnel, which cost $60,000, and will enable the Albion at a distance of 1800 ft. to tap its vein at a depth of 1000 ft.——D. C. Corbin has commenced work on his coal properties twelve miles south of the Canadian Pacific line, near the Crow's Nest Co.'s holdings in East Kootenay, B. C. Considerable preliminary work will be done this season. Mr. Corbin has 16 square miles of coal land under lease. He is building the Spokane International railway to connect Spokane with the Canadian Pacific.——A bond of $100,000 has recently been taken on the Gladstone property on the Smilikameen in Okanogan county. Spokane people are the owners of the Gladstone and also the American Copper Co., which owns property adjoining the Gladstone and is being developed.

Spokane, June 9.

Special Correspondence.

DENVER, June 11.

Colorado is not generally reckoned as a placer-mining region. While it is true that the first mining done in the State was alluvial, following the rule of nearly all new countries, still the lodes so quickly outstripped the placers in importance that the State became known for its gold and silver veins way back in the day's when California and Montana and Idaho were busy giving nervous thrills to the world with their production of river gold. It may surprise some people to know that Colorado has one of the largest gravel mines in active operation south of Alaska. The mine at Granite, generally known as the Twin Lakes Placer, has two six-inch giants running under 350-ft. head of water continuously against a bank of soft gravel from 80 to 100 ft. high. The season lasts from early May to November. About 160 acres has already been washed and there are about 1,800 acres left to wash. The property belongs to an English company and is operated in a very quiet way. An Englishman named J. Loggin is superintendent and he is better known as a champion rifle shot than as the manager of a placer mine. The ground so far washed has averaged 10c. per cu. yd. Speaking of these matters, brings to mind the so-called placer mines at Hartsell on the Colorado Midland. These deposits have been called alluvial deposits by the local press, but they are nothing of the sort. I was fully informed of this deposit last November by the man who, thus far, has made the only real thorough examination, but at his request I have said nothing of it. So much that is untrue has been published in the last few days, however, that I think I am free to correct some wrong impressions. This deposit is a huge mineralized dike or overflow of rather soft tufaceous rock. It has been extensively mineralized with gold, and the gold is in the amorphous or 'rusty' form, usual to such formations. It will cyanide readily but does not amalgamate at all well. This sort of an occurrence is not at all unique. The huge dike at Ely, Nevada, is gold-bearing on its northeast end and copper-bearing on its southwest end. There is a similar gigantic mineralized dike about midway between Helena and Butte in Montana; I forget the name of the district. Jim Breen owns about 1,200 acres of it and F. Augustus Heinze owns most of the balance. There is also such a dike on the Clearwater near Grangeville, Idaho. When the newspapers speak of a mineralized dike of $3 ore, one mile wide and four miles long, they give the impression that it is all ore. Such is not the case. These huge dikes have great, irregular bodies of ore in them, but, of course, they are not "all ore." Some time they will be profitably worked. Ely was a failure, as a gold-mining proposition. Heinze has never had the nerve to tackle his proposition. The Atlantic and the Evergreen at Grangeville are making a brave struggle with fair hopes of success, but nothing is proved yet; so the past history of these huge dike propositions simply warns us to go slow before we count up the millions of profits in this so-called new thing at Hartsell. As a matter of fact it is not at all new, but the papers have just learned that it exists. I remember camping overnight with a Hartsell prospector in 1891 and viewing his claim. I was too young to know a mine from a hay-stack then, but the prospector was just as sure he had the biggest mine in the world in 1891 as any 1906 prospector is sure of the same thing today. There seems to be a very fair show that some of the larger orebodies at Hartsell may be worked at a profit. If so it will be a great thing for the State.

DENVER, June 10.

The Gunnison tunnel is driven for a distance of 13,000 ft., and the work is being carried steadily forward. The tunnel, when completed, will be about six miles long, and will, it is estimated, carry sufficient water to irrigate 40,000 acres of land in Delta county. It is expected that the work will be finished in 1907, and already the farm lands of Delta and Montrose counties are rapidly appreciating in value. The stimulating effect of the enterprise is adding to the population of the Western slope, and it is stated that every acre of the irrigable lands to be watered through the tunnel has been flied upon by bona fide settlers.

Thomas F. Walsh, formerly owner of the Camp Bird mine, in Ouray county, is taking an active interest in determining the extent and value of the South Park gold discoveries. Mr. Walsh and John W. Benson, who managed the Camp Bird properties under Mr. Walsh, contemplate mining and reducing the ores of South Park on a large scale, provided present indications are realized by development.

An aerial tramway, 13,000 ft. long, is projected to carry tourists from Silver Plume to the top of Leavenworth mountain. Work has been commenced at Silver Plume and it is proposed to have the tramway in operation early in July. The enterprise is backed by Eastern capitalists and their plans contemplate the erection of a summer resort on the mountainside, and other attractive features.

It is stated that plans have been matured by Otto Mears to operate his railroads that radiate from Silverton, through the winter. The report is that Mr. Mears has already entered into contracts to transport the ores from Red Mountain and Animas Forks districts next winter. Preparations to control the snowslides prevalent along these routes are now under way. The first cost of necessary snow-breaks and sheds will be large, and the project to maintain communication with the high altitudes of the San Juan, during the winter months, is of great moment to that region. Should the undertaking prove successful, a large part of the objections often heard against mining in the San Juan will be overcome, and that region will attract many investors who now hesitate to combat the rigorous winters.

It is stated that the dredge-boat of the Reliance Gold Dredging Co., operating in French Gulch near Breckenridge, is taking out $1,000 per day, and that the richest part of the placer ground has not yet been reached. There is unusual activity and a renewal of interest in the placer mines of Summit county. Continued development of the Flossie vein recently cut by the Vidler tunnel of the Transcontinental Transportation & Mining Co. has disclosed an unusually large body of smelting ore. The shoot is over ten feet wide, the larger part of which is of a smelting grade averaging between $40 and $50 per ton, in gold, silver, and lead. The Vidler tunnel is being driven continuously to explore at depth veins that have produced heavily from near the surface. The Raymond mine, near Ohio City, in Gunnison county, which was partly developed several years ago and remained idle for a long time, has been developed into a producer and equipped with an amalgamating and concentrating plant which has been in operation since last fall. It is reported that a large tonnage of ore has been developed and that the mill is making a large and profitable output.

A searchlight of great power is to be placed on Pikes Peak this week. It is confidently expected by the projectors of this attraction—the cog-wheel railroad operators—that the light will be seen from Denver and other distant points.——The Ophelia tunnel, in Cripple Creek district, is becoming the scene of considerable activity. Since the phenomenal ore-shoot opened through the tunnel in the Work Co.'s ground, has been producing, a number of parties have secured leases and are exploiting various veins cut by the tunnel. The rich shoot (which produced $50,000 in May), was found by following a small, vertical vein to its junction with what is known as the Gold Hill flat vein. Prospectors are now proceeding on the theory that a large number of the verticals, whether barren or payable, lead to rich shoots in the flat vein. As this theory has been successfully followed in several instances in Gold Hill, it would seem that a fair average of strikes will be made through raising from the Ophelia tunnel. The Cresson mine of the Bull Hill Mining & Leasing Co. is opening up new bodies of ore. Under the management of Richard Roeloff it has become a constant shipper and a profitable mine.

TORONTO, June 2.

The Ontario Bureau of Mines announces that shipments of ore from the Cobalt district to the smelters, for the three months ended March 31, amounted to 360 tons. The silver contents aggregated 580,825 oz., being an average of 1,613 oz. per ton, valued at $362,248, and the cobalt contents amounted to ten tons, of the value of $10,360. Since shipments of ore began in the latter part of 1904, the total value of the ore shipped approximates $2,250,000.

As a result of the recent dynamite explosion and fire, writs covering about 80 claims for damages have been issued by the owners of property destroyed against the Ontario Powder Co., of Kingston, Ontario, and the George Taylor Hardware Co., of New Liskeard, who are held responsible for the storage of the explosive in the town. The total amount of the claims is about $28,000.

The excursion of members of the Ontario Legislature to the Cobalt camp and the region farther north, left Toronto on May 29. About 60 legislators and a number of journalists and other invited guests made up the party. Mr. Frank Cochrane, Minister of Lands, Forests and Mines, and three other members of the cabinet accompanied the excursion, which was something unique in the way of a legislative trip, owing to the fact that no liquor was (officially) provided. At Cobalt the party visited the Timmis, or La Rose, and Trethewey mines, at the former of which a timely discovery of a new rich vein had just been made. It is about five inches wide on the surface. A nugget was also exposed, the contents of which were estimated at 100 lb. of almost solid silver. Some of the visitors went on to the end of the Temiskaming & North Ontario road, 52 miles north of New Liskeard. The excursionists returned to Toronto on June 1.

Owing to the interest excited by Cobalt developments, gold mining operations in northwestern Ontario have attracted but little attention. Nevertheless considerable activity is being shown in this field. At the Redeemer gold mine in the Wabigoon district work has been resumed under the direction of Superintendent Eames, and extensive development is projected. The shaft is now down 225 ft. and a cross-cut is being run at the 200-ft. level for several hundred feet north, to tap two large veins. On one of these a 200-ft. shaft will be sunk. At the Lost mine immediately adjoining, a shaft will be put down 100 ft. At the Laurentian mine in the Kenora (formerly the Rat Portage) area a 20-stamp mill has been installed. Five stamps are being put in at the Olympia mine in the same locality. American capitalists are actively looking out for chances of profitable investment in this region. J. W. Keenan, of Detroit, recently purchased two gold locations in the Wabigoon area. A number of mining divisions have been established under the new Mines Act. These include Sudbury, Port Arthur, Fort Frances, Temiskaming, Sault Ste. Marie, and Kenora. For each of these a recorder will be appointed, so that applications for mining locations can be made on the spot instead of at Toronto.

The Klondike Water Supply Co. has been incorporated with $6,000,000 capital to bring water for hydraulic mining from the Klondike river to Bonanza, Hunker, Eldorado, Gold Run, Sulphur, and other creeks. The incorporators are Alex. McDonald, Dr. Wm. Barrett, and A. B. Palmer, of Dawson, Robert Kelly, of Vancouver, and Alfred Hitchcock, of London, England. The details of the arrangement by which the Yukon Government and several Yukon mining companies secured the services of C. M. Hatfield, the Los Angeles rain-maker, have been made public. Hatfield contracts to increase the rainfall in such parts of the Yukon as may be indicated by the Rainfall Board, a body to be nominated partly by the Yukon commissioner and partly by himself. If he succeeds, in their opinion, he is to get $10,000—if he fails, he gets only his expenses, including transportation to and from Los Angeles. He was due at Dawson on May 1. The Government has been subjected to a good deal of ridicule for engaging his services.

CALUMET, June 2.

Exploratory work will be started in a few days on the old Carp Lake mine in the Porcupine Mountain copper range of Ontonagon county. E. E. Boalt of Cleveland, O., will have charge of operations. He arrived a few days ago and left for the mine with a crew of men. H. L. Payne of Cleveland, who is interested in the property, will arrive at the mine in a few weeks. The Carp Lake property is in the same section as the Nonesuch, which recently passed into the control of the Calumet & Hecla Mining Co. Arrangements are being made for the exploration of the property by means of diamond-drills, a contract for the work having been let to Cole & McDonald of Duluth, large operators in the Michigan copper district and on the iron ranges of Lake Superior. Like the other properties of the Porcupine Mountain district, the Carp Lake is opened on conglomerate sandstone in which the copper is exceedingly fine, though freely disseminated through the rock. Estimates of the copper contents run as high as seven per cent. The metal is in thin flakes, which float on water, and it is the belief of the owners of the property that the metal cannot be saved by any ordinary process of concentration. The vein is seven feet wide, practically the same as at the Nonesuch, and dips at an average of only 26°. One shaft has been opened to a depth of 350 ft. Alfred Meads of Marquette, an authority on the history, geology and mines of Ontonagon county, is of the belief that the Carp Lake copper is not too fine to be saved by the machinery now in general use. He says it is not flake copper; maintaining that it is granular and will not float, though easily carried away by a strong stream of water. Mr. Meads is of the opinion that a mistake has been made in sending much of this ore to the mill, as some of it runs as high as 40% copper, and should go direct to a smelter. Whatever may be the ultimate result of the Calumet & Hecla's work on the Nonesuch, the mine will receive an efficient test. The solution of the problem of saving the Nonesuch copper would mean equally important results to the Carp Lake, as the two properties are similar in the nature of their copper deposits. There are mines in the Lake district which are operating lower grade copper ore than that traversing the Nonesuch and Carp Lake properties, and

they are earning substantial profits. There is no question about the copper content of the ore of Porcupine Mountain district, it is simply a question of recovering the copper. More difficult problems than this have been solved in mining practice.

Rapid progress is being made in the erection of the new steel shaft and ore-house at No. 3 shaft of the Wolverine mine. The frame-work of the structure is up and the building is being inclosed. In the meantime the skip-road is being improved and rebuilt. Crossties are being used, instead of stringers, as formerly. —— A new copper property near Blanc river, in Cobden township, Ontario, is being opened. Three test-pits have been sunk on the outcrop of a vein of copper ore 12 ft. wide. In addition to copper, the ore carries a small amount of gold and silver.—— Work in the Rhode Island mine is confined to operations in the drift which is being driven north on the West vein at the tenth level. This drift is now 625 ft. The vein averages six feet in width and shows a small amount of copper. At the eighth level, 1,000 ft. below the surface, drifting north was stopped some time ago, after penetrating 1,336 ft. Stoping was carried forward there for some time, but the lode was not uniform enough to warrant the continuance of the work. The tenth level is now entering the ground in which the best results were secured on the eighth level.

At No. 1 shaft, of the North Kearsarge branch of the Osceola Consolidated mine, work is under way on the installation of a new type of skip which is expected to eliminate the trouble that has existed there. Ore shipments from the other openings of the mine will be increased so that there will be no change in the mine's total yield.—— Automatic-dumping steel cars are now in use in shipping ore from the Mohawk and Wolverine mills, on Traverse bay, to the plant of the Michigan Smelting Co. on the south shore of Portage lake. The use of these cars recently succeeded the packing of mineral in box-cars, which, in turn, followed the more antiquated method of shipping it in barrels.—— At the King Phillip property, situated on the line dividing Houghton and Ontonagon counties, and adjoining the Winona on the south, the shaft has been sunk through the overburden and is in rock. The shaft is 14 by 25 ft. and around the collar the earth has caved to a depth of 20 ft. It is planned to drive planks down vertically inside the shaft to rock, in order to stop further flow of the sand down the outside of the shaft, whence it boiled in beneath the timbers and up into the shaft. The new hoisting engine for No. 1 shaft has been delivered at the Winona spur of the Copper Range railroad and will be hauled the remaining mile by teams.

CALUMET, June 10.

The Tyrone Development Co., capitalized for $300,000, has been incorporated under the laws of Minnesota by Lake Superior mining men, and will acquire and develop copper properties near Silver City, New Mexico. The only stockholders are the persons mentioned in the articles of incorporation. The directors are: Thomas F. Cole, John D. Clarke, James L. Norman, Lee W. Farmer, James Wanless, W. W. Billson and Chester A. Congdon, all residents of Duluth. Cole and Congdon are directors of the Calumet & Arizona, Butte Coalition and other large copper corporations. It is said that the new concern will acquire and develop the Burro Mountain property, near Silver City. I. L. Merrill, formerly superintendent of the Calumet & Arizona mines at Bisbee, Ariz., is at present the owner, and the work will be conducted under his management. The general offices of the corporation will be located in Duluth, but there will also be offices at Pittsburg, Pa.

Diamond-drill explorations have been started by the Isle Royale Co. on the Isle Royale lode in its land between Section 11 and the southern workings of the old Huron mine. The result of driving in this direction from the new shaft is promising, and if similar conditions are found in the diamond-drill holes a new shaft will be started for permanent operations.

Some work is being done in No. 5 shaft of the Tamarack mine, but the water which accumulated in the workings during the suspension caused by the fire, still prevents production. It is expected that the shaft will be drained sufficiently by the end of the week to permit ore shipments to the mill. It is expected that shafts No. 1 and 2 will be in shape to resume production in a few weeks. In the meantime No. 3 shaft, at the North Tamarack branch, continues production on an enlarged scale.

A. J. Youngbluth, secretary, has issued a circular letter announcing that the twelfth annual meeting of the Lake Superior Mining Institute will be held in the copper country, on August 8, 9, and 10, 1906. Local committees are arranging a program for the entertainment of members and guests who attend. The last meeting held in this section was in March, 1901. It is expected that a great many prominent mining men in the Lake Superior copper and iron districts, who are members of the association, will attend the meeting and other mining districts of the country will be represented by prominent men.

Preparations for the exploratory work will be conducted on the old Nonesuch mine in Porcupine Mountain copper range of Ontonagon county for the Calumet & Hecla Mining Co., and are progressing rapidly. Considerable machinery has been delivered at Ontonagon and indications are that work will be conducted on an extensive scale. Charles S. Smith of Oconto, Wis., has arrived at the property to take charge of the work. Cole & McDonald of Duluth, who have the contract for the diamond-drill work, have part of their outfit on the ground. Two drills are to be used and a thorough test of the Nonesuch will be made. In addition, some of the old shafts will be unwatered. These openings are down a few hundred feet and will permit an examination of the ore at that depth. If the prospects are favorable, it is likely that some of the openings will be extended. Some of the old buildings on the Nonesuch have been repaired to accommodate the men to be employed by the Calumet & Hecla Co. and by Cole & McDonald.

Work of equipping the new stamp-mill of the Victoria Co. in Ontonagon county is practically completed, and the machinery will be tested this week. The ore bins are full, but some minor adjustments of the working equipment will be made before the plant is placed in regular service. The mill is built substantially and equipped with modern appliances for concentrating the copper. One head is installed, and there is room for another. While it has never been claimed for the Victoria that its ore is rich in copper, the openings underground show fairly good mineralization, and it is believed that the low operating costs resulting from the hydraulic power plant will admit of good profits. There is a large tonnage of milling ore blocked out in the mine.

Sinking in the shaft on the property of the Lake Copper Co. in Ontonagon county has passed the fourth level, 400 ft. beneath the surface, and is under way to the fifth level. Sinking has been in good copper ground continuously since work was resumed by the present organization and 50 ft. of good 'stamp rock,' with mass and barrel copper, have been opened. Diamond-drill work on the Lake Co.'s property has reached a depth of 1,000 ft. Preparations are being made to start a second bore in the series which will be drilled to obtain a cross-section of the property. There is little overburden where the second hole is to be started and no difficulty should be experienced with the work there; but at other points the overburden is excessively heavy, and because of this condition it may be decided to rig up a larger outfit at the first hole and bore to greater depth. In this manner the same results would be secured as by the more difficult process of putting a new hole down through the heavy overburden.

The Northern Ontario Copper Co. is meeting with success in its efforts to open a copper mine at the Leziert and Bronson property, near Dean Lake, Ontario. It has a well-equipped camp with 20 men at work there. Night and day shifts are employed and the shaft is being sunk at the rate of three feet every 24 hours. Six substantial buildings have been erected where four months ago was only a forest. There have been installed and are in operation two boilers, air compressor, two machine drills, hoisting engine, etc. A dam has been built across a stream near the shaft house to provide a water supply. The shaft is nine by sixteen feet in size, and is down 72 ft. Over 1,000 tons of shipping ore is on the dump, and shipments will be started next week. It is planned to start cross-cutting and drifting on the 100-ft. level of No. 1 shaft, and connect with the shaft on the Bronson location. The company has 280 acres of mineral land and will ship its ore over the Canadian Pacific railway, which has tracks to within one and three-quarters mile of the mine.

SALT LAKE, June 11.

Several additional damage suits were filed against smelting companies, operating at Bingham Junction and Murray last week, the complainants being farmers owning property in the vicinity of the smelters. A committee of three, representing a large number of farmers, asked the county attorney to take steps to have the smelters declared a nuisance and ordered closed unless the fumes be rendered harmless to vegetable life. The committee contended that greater damage has been done to crops this year than ever before, owing to damp weather. The attorney stated that he would make an investigation of conditions personally before making a move one way or the other. The agitation and the multiplicity of suits, now pending in the courts, has brought the smelting companies face to face with a serious question. Some managers declare it would be as cheap for the companies involved to move their plants to a site remote from the farms. It is not unlikely that the day will come when these plants will be concentrated somewhere near Garfield, the site of the American Smelting & Refining Co.'s new plant and the concentrating mills of the Utah Copper and Boston Consolidated mines.

Prospecting of the West Quincy mine at Park City by means of core-drills from the 440-ft. level is about to begin.——At the close of last week the Daly-Judge Mining Co. had outstanding bonds amounting to $32,000, which will be called in and cancelled before July 1. John J. Daly, the president, also stated that on January 1 last the company had a bonded indebtedness of $209,000 and $22,000 in an overdraft. The company has earned from $70,000 to $75,000 monthly from the sale of ore and concentrate, and has paid off bonds on an average of $45,000 monthly. The expense of operation has been between $23,000 and $25,000 per month. Both the ore and concentrate shipped ran about $45 per ton. The mill is treating 175 tons per day, making a saving of 90 %. A satisfactory contract has been obtained from the American Smelting & Refining Co. The ore carries a heavy percentage of iron and with the lead present forms a suitable flux for the silicious ore coming from Nevada.——A meeting of the board of directors of the Thompson Mining Co. operating at Park City will be held this week. The question of resuming work will be discussed.——The directors of the Daly-West Mining Co., at Park City, have ordered payment on June 15 of the regular quarterly dividend of $108,000.

An examination of the Southport mine, at Stockton, has been in progress for several days for the prospective purchaser of a large interest.——A drift has been started from the 1,000-ft. level of the New Stockton mine, at Stockton, to tap the Catherine fissure.

The shipment from the Tintic district last week aggregated 144 carloads, the shippers and amounts being: Gemini, 26; Centennial Eureka, 35; Eagle & Blue Bell, 7; Uncle Sam Consolidated, 5; Beck Tunnel Consolidated, 7; Yankee Consolidated, 3; Bullion Beck, 11; May Day, 2; Eureka Hill, 3; Black Jack, 3; Mammoth, 3; Carisa, 2; Grand Central, 4; Scranton, 3; Dragon Iron, 23; other mines, 6. The Tintic district has more shippers than any other camp in the State. The Grand Central, Mammoth, Victoria, Swansea and Uncle Sam Consolidated companies announced dividends this week for June of $15,000, $20,000, $12,500, $5,000 and $5,000 respectively.——Late developments in North Tintic are interesting and indications are favorable for the opening of some good mines there.

There is a possibility of the re-organization of the Ohio Copper Co. with a strong syndicate of Eastern capital in control. The mines of this company have been examined recently by Thomas Weir, former manager of the Highland Boy (now Utah Consolidated), Duncan MacVichie, manager of the Bingham Consolidated and Alfred Frank of Butte. If the company is not re-organized, there will be, at least, a bond issue.—— The Bingham canyon mill of the Utah Copper Co. is treating 600 tons of ore daily, and during the month of May produced 1,000 tons of concentrate, on which was realized nearly $100,000.——The mineral opened recently in the northeast part of the Utah Consolidated mine, at Bingham, according to R. H. Channing, manager, is the largest ore-shoot opened in the property. The ore carries from 7 to 10% copper and about $12 gold.——The compressor plants recently ordered for the New England Gold & Copper and Last Chance mines, the latter owned by the Nevada Utah Mines & Smelters Corporation, have been installed.

The organization of the Caliente & Pioche Railroad Co. has been announced with the San Pedro, Los Angeles & Salt Lake Co. in control. The road will be 30 miles long and will follow the grade built many years ago. It is said there will be no delay in getting the work started. The Nevada Utah Mines & Smelters Co. is said to have deposited $80,000 to the credit of the San Pedro, Los Angeles & Salt Lake Co. to encourage early construction and as a display of good faith. This amount is to be returned in the shape of deductions from freight charges.——The Utah Copper Co. has placed an order for 1,104 vanners with the Union Iron Works Co., San Francisco, for the new Garfield mill, now being constructed. The General Electric Co. will supply the electrical equipment, which includes two 2,000-h.p. steam-driven generators and about 30 motors, of various sizes.——It has been announced by an official of the Garfield smelter that some of the furnaces of the new plant will be blown in within the next ten days.

C. A. Short, of Fay, Nevada, manager of the Jennie Gold Mining Co., at Goldsprings, Utah, will soon be in the market for a mill.——The May ore and bullion shipments for the mines of Utah, as reported through the Salt Lake banks, aggregated a total of $1,918,350.

——The Garrison and Monster groups in the Deep Creek region have been consolidated, forming the basis for the organization of the Garrison-Monster Mining Co.

——The Continental Transportation Co., Henry M. Crowther, manager, has practically completed the survey of a railroad into the camp of Alta. The old line, formerly operated by the Rio Grande, was leased by Mr. Crowther for the Continental Co. several months ago. He states that trains will be operating into Tannerville, five miles below Alta, within eight months.

BUTTE, June 10.

The Amalgamated Copper Co., North Butte and Red Metal Co., the latter the successor of the Heinze interests in Butte, have made their annual reports to the tax authorities, showing the gross and net proceeds of operations during the year ending June 1. The net earnings of the Amalgamated companies amounted to $13,805,811.67, which is an increase of $5,113,568.15 over the previous year. The Parrot Co. alone showed a decrease, while the Washoe again showed that all of its earnings were spent in smelter improvements, machinery purchases, etc. The Anaconda Co. made a remarkable showing, its increase over last year in net earnings being $1,233,878. The following table gives some interesting figures on Amalgamated operations:

	Anaconda.	Washoe.	Parrot.	Trenton.	B. & B.	B. & M.
Tons ore extracted	1,521,310	95,210	163,569	168,770	246,593	1,209,805
Gross proceeds	$16,613,537 01	$1,146,981 03	$1,397,406 82	$1,549,099 43	$2,821,319 49	$15,509,832 05
Cost of mining	5,525,320 52	412,723 59	596,508 75	492,552 82	866,357 81	4,182,508 24
Freight on ore	231,999 75	19,042 02	29,442 42	25,315 47	49,318 62	1,129,547 14
Cost of reduction	3,457,007 38	260,288 48	353,158 54	353,280 40	509,028 03	2,958,666 43
Marketing charges	1,645,943 94	97,764 35	141,281 75	136,422 20	320,722 24	1,081,000 68
Total	$10,860,271 59	$1,322,702 25	$1,120,391 46	$1,007,570 89	$1,745,426 70	$9,351,722 49
Net proceeds	5,753,265 42	.....	277,015 36	541,528 54	1,075,892 79	6,158,109 56

A comparison of the net proceeds of the properties owned or controlled by the Amalgamated Copper Co. for the last two years follows:

	1904-1905	1905-1906	Increase.
Anaconda	$2,259,693 73	$5,753,265 42	$3,493,571 69
Parrot	328,106 69	277,015 36	*51,091 33
Trenton	70,110 22	541,528 54	471,418 32
Butte & Boston	178,712 81	1,075,892 79	897,179 98
Boston & Montana	5,855,620 07	6,158,109 56	302,489 49
Total	$8,692,243 52	$13,805,811 67	$5,113,568 15

*Decrease.

The total net earnings of the Amalgamated companies was almost double the net earnings reported the year before, the latter having been $6,240,024, apportioned as follows: Anaconda, 1,259,875; Parrot, $233,964; Trenton, $74,832; Butte & Boston, $96,853; Boston & Montana, $4,574,498.

The Red Metal, North Butte, and Alice companies have reported as follows:

	Red Metal M. Co.	North Butte.	Alice
Tons of ore extracted	149,101	259,650	3,831
Gross proceeds	$1,929,568 17	$5,480,545 24	$31,524 81
Cost of mining	587,460 66	1,160,766 21	.....
Freight on ore	89,460 60	52,017 23	.....
Cost of reduction	587,696 51	1,255,753 04	.....
Marketing charges	223,651 50	.....	.....
Improvements	.....	1,164,000 00	.....
Total	$1,488,269 27	$3,632,536 48	$37,396 51
Net proceeds	441,298 90	1,848,008 76	.....

The Red Metal Mining Co.'s net proceeds are for the period from February 1, 1906, to June 1, 1906.

An interesting fact about the former Heinze mines (Red Metal) is that regularly for a number of years Heinze reported net earnings at $600,000 annually, while the new owners, without increasing the output, report net earnings of $441,298 for four months.

The Butte district in May produced 33,881,450 lb. copper. The Anaconda and the Boston & Montana had a material increase both in ore production and copper. There was a falling off at the Parrot, due to interruptions caused by sinking and exploration work. As a new body of ore has been opened on the 1,800-ft. level, the output is likely to be better in June.

The total tonnage of ore and the production of copper for May are shown in the following table:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	124,000	8,680,000
Anaconda	130,200	8,983,800
Butte & Boston	20,150	1,309,750
Washoe	15,500	976,500
Parrot	12,400	818,400
Trenton	16,120	1,209,000
North Butte	27,900	3,224,000
Butte Coalition	49,600	3,092,500
Original	27,900	2,092,500
East Butte	6,200	558,000
Raven	4,030	443,300
Pittsburgh	3,100	223,200
Total	561,900	33,881,450

The Davis-Daly Estates Copper Co., recently organized by J. A. Coram and associates, will shortly begin operations in Butte district, as a contract has been made with the Original Mining Co. to run a cross-cut 3,500 ft. from the 1,800-ft. level to the Original mine. The Davis-Daly Co. owns 400 acres of ground in the heart of the district, much of it being in the business section of Butte. In the group there are ten claims that have been developed. The mines purchased from the Daly estate have not been worked since the death of Marcus Daly. Several of the Daly mines were good producers of silver at the time work on them was stopped. All of the properties of the Davis-Daly Co. adjoin, or are near, some of the big producing mines. A number of the claims lie just south of the Anaconda, Parrot, Original, Gagnon and other mines of the Amalgamated Co., and it is expected that by the long cross-cut to be driven from the Original a dozen or more veins will be cut at a depth of 1,800 ft. A shaft will be sunk near the end of the cross-cut in the southern part of the district and will connect with it. Another shaft will be sunk on the Hesperus and a cross-cut driven north. Some of the Davis mines will be reopened and it is expected that with a little preliminary work they will become productive. The Davis-Daly Estates Co. is the most important mining corporation formed to operate in the Butte district since the organization of the North Butte Co. The directorate includes F. Augustus Heinze, Henry Mueller, M. S. Largey, L. S. Gillette, C. R. Leonard, John MacGinniss, G. W. Davis of Butte; C. K. McCornick of Salt Lake, Karl J. Roebling of Trenton, N. W. Bumstead and J. A. Coram of Boston.

In a report to the stockholders of the Raven Mining Co. John Berkin, general manager, describes the progress made in development during the past twelve months. No mining was done in the Raven, all development and operations being confined to the veins that apex within the boundaries of the Snoozer claim. The work was done on the Snoozer because of its proximity to the extensive orebodies of the Mountain Consolidated properties of the Amalgamated Co., and also because the company was able to secure a lease on the Buffalo shaft of the Anaconda Co., through which it was enabled to develop the veins of the Snoozer to greater depth and more economically than would have been possible through the workings of the Raven Co. During the year the company cut 5,780 ft. of levels, crosscuts, drifts, and raises. On the upper levels the veins are of little value, but important orebodies have been discovered on the 1,200 and 1,500 levels of the Snoozer. A good grade of ore is being mined on the 1,200-ft. level, and on the 1,500-ft level the same orebodies are found to be larger. The company is shipping 130 tons of ore per day, which will be increased to 200 tons. The average yield is 4% copper, 10 oz. silver and $1.50 gold per ton. It has become necessary to construct a number of levels between the 1,200 and 1,500-ft. levels to open the orebodies more extensively. Below the 1,500, levels will hereafter be driven 100 ft. apart.

At a meeting of stockholders and directors held in Butte, the following officers of the Raven Co. were elected: William D. Thornton of Butte, president; John Berkin, of Butte, vice president and general manager; Charles Mattison, of Butte, secretary and treasurer; E. C. Frisbie, of Hartford, C. J. Root, of Bristol, Charles E. Morris, of Pony, Mont., Charles Schmidt, of Butte, directors, in addition to the other officers, who are also members of the board.

The condition of the Parrot mine is improving. At the annual meeting, while no official report was made, John D. Ryan, managing director, made a statement to the effect that the mine was again showing up encouragingly. A new orebody was opened on the 1,800 level, and while the ore is low grade it is better than the bulk of that the company has lately been shipping. Mr. Ryan said the operations last year were not so profitable as could have been wished, due mainly to the Heinze litigation which prevented the company from mining on what it claimed to be its veins, and which resulted in a suspension of operations for some time. At a meeting of stockholders of the company held in Butte, the old board of directors was re-elected. The by-laws were changed so as to permit the directors to meet in Boston or elsewhere.

The Reins Copper Co. stockholders voted to change the place of the annual meetings to Pittsburg, nearly all the directors being Pittsburg men. The company has met with disappointment in its search for veins at a depth of 1,200 ft. It is expected that within 80 ft. to the north of the shaft a vein would be cut, as a small one was opened at the 800-ft. level, 40 ft. from the shaft, but the cross-cut has been driven 130 ft. without enccuntering a vein. The south cross-cut is in 60 ft. and nothing has been found in that direction. The Reins mine is situated east of, and adjoins, the Leonard mine of the Boston & Montana Co., and it has been expected that the Leonard vein would be found in the Reins, but some mining men say the vein is faulted near the east end of the Leonard ground.

The shaft being sunk on the Six O'Clock group by the Butte Exploration Co. has reached a depth of 630 ft., of which 110 ft. were sunk in May. The shaft will be sunk to 1,000 ft. before cross-cutting.

The Cable Consolidated Mining Co. has shipped boring machinery to its placer property, and will bore 330 holes, being one on each acre of ground. A new hoist is being put up at the quartz mine and as soon as the machinery and new equipment is in place the output will be materially increased.

At the Butte reduction plant of the Original Consolidated Mining Co. a new blast-furnace, designed for treating ore by a new process in which gas was to be used as fuel was installed for a test. It was given a fair trial but proved a failure and will be taken out, an old-style furnace being put in its place. The plant is treating all of the Clark ore—about 900 tons per day, shipments to the Washoe smelter having been stopped. Orders have been given for the enlargement of the smelter of the Boston & Montana Co. at Great Falls, and when completed the plant will be able to handle an additional 1,500 tons of ore per day. It is now treating 4,000 tons daily.

Two new mining companies were organized in Butte during the past month, one being the Hazel Mining Co. by Butte men; the other, the Daisy Bell Gold & Copper Development Co. This is the third Daisy Bell Co. organized to work this property. The company organized some time ago has an option on the Daisy Bell mine but was unable to take it up. Its promoters claim that an extension was granted and they proceeded to sell stock and expected to take up the option when the new company made its appearance. New York people were interested in the previous organization and trouble is likely to ensue, as charges of bad faith are made, in Butte, against the owners of the property. The latest company is capitalized for $600,000.

The plant of the Montana Zinc Co. has been shut down pending improvements, and the doubling of the capacity of the plant. The company is still receiving ore from the Lexington and Moulton mines.——The Butte Copper & Zinc Co., which owns the Emma and Czaromah mines in the southwestern portion of the city, has let a contract for machinery for the Emma. The Czaromah adjoins the Emma and will be operated through the Emma shaft. There is a large vein running through both claims. Samples from the Emma assay 45.3% zinc, 9% lead, some gold, copper, and silver. The properties will be mined for zinc ore of which there is an abundance in both mines.——The Tuolumne Copper Mining Co. is one of the late Butte organizations. The Tuolumne mine adjoins the North Butte group, and is a fractional claim. It is tied up in the courts in litigation over the estate of James Tuehy, who owned the mine, and it will probably be a long time before the property is released by the courts. The new company represents some of the interests in the Tuolumne, but not all.

LONDON, May 30.

Several important flotations lately are said to have gone off well—so far as substantial underwriting is concerned. One of the most prominent is Great Cobar Ltd. With a capital of £750,000, divided into 150,000 shares of £5 each, and with first-mortgage debentures to bearer of like amount in bonds of varying sums, the Company has been formed to acquire as a going concern a property of this name well-known in New South Wales, consisting of copper, gold, coal mines, coke works, smelting, refining and electrolytic installations. A synopsis of the properties is given in the prospectus, which describes them as being "the largest copper producers in Australia." From 1894 to 1902, 730,669 tons of ore were extracted, which produced 23,922 tons of copper. The present reserves are estimated at 1,530,506 tons, which are expected to yield 40,449 tons of copper. The present price of copper is high, and according to the report of Chas. M. Rolker, which accompanies the prospectus, and which was made so recently as April 5 last and telegraphed, the net profit on the above figures is estimated at £2,346,000. The reports show that at 850 ft. the lode ranges from 60 to 100 ft. in width. The coal reserves are estimated to contain 6,000,000 tons. Most exhaustive reports have been presented, not merely by Mr. Rolker, but by J. D. Kendall, and W. J. Barnett. That of Mr. Kendall describes the property as most valuable, and he is fully satisfied that his estimates with regard to it under proper management will be realized. He found the ore blocked out to be equal in quantity to over seven years' output at the present rate of consumption, and four years' output at the more expeditious rate at which it is in future intended to work. Mr. Barnett, in effect, confirms the views of Mr. Kendall, and the figures with which the report of Mr. Rolker bristles are most encouraging as regards the profits the Company may expect. At the present rate of production—4,000 tons of copper per annum—it is estimated the profits would enable 15% to be paid on the share capital, after providing for the debenture interest, which is at the rate of 6%. The profits would be proportionately increased on the larger scale on which it is intended to work. Subscriptions for £420,000 of debentures and for £116,000 shares, which will give the Company a cash working capital of £150,000 with £200,000 debentures in reserve, have been assured. The price to be paid for the properties, as a going concern, is £1,006,000, of which £800,000 is payable in cash and £55,000 in fully-paid shares, and £151,000 in cash, shares or debentures at the option of the Company. The board is practical and influential. At its head is William Rich, who was formerly general manager of the Rio Tinto mines, and another of its members is Rudolph H. Henning, well known for his deals in Westralian and Mexican mining.

Capital also continues to be found in London, to a moderate extent and in a tentative way, for Cornish mining. One of the newest recruits to the limited liability system is Wheal Kitty in the St. Agnes district. At a meeting of the 'Adventurers' held last week the chairman, J. H. Collins, reported that they were asked at the last meeting, as pursers, to see whether there was a feeling in favor of carrying on under the cost-book system, and they were authorized, if so, to issue 1,000 additional shares at the price which had then been paid up. A number of people in Cornwall, were all very friendly in the matter. They look upon the mine as a good one, but they found, like other people, that the cost-book system does not recommend itself now. Whatever opinions they might have about the goodness of the system, it is very difficult to raise any capital under it. Having put the cost-book system to the test, the pursers now find it is best to take steps at once to convert this Company into one of limited liability. A cash capital of £30,000 is to be raised.

In dealing with the record of the mine, Mr. Collins reminded the meeting that Wheal Kitty was an old mine when Henwood's description was published in 1843, but there are no statistics available as to its production earlier than 1852. Since then the mine has had a checkered career—sometimes very rich—at others poor, but it has turned out more than half a million pounds worth of tin ore in spite of the fact that it has always been worked in a hand-to-mouth fashion. With the enlargement and equipment of Sarah's shaft as a main shaft, and with the provision of boring machinery to expedite the developments, the mine could not fail to have a profitable future. and all this it is intended to do by the aid of the new capital now to be raised. Capt. Prisk reports May 23, 1906: "Vottle, 30 east now in settled country 18 fm. east of the shaft, after passing through two cross-courses, is 3 ft. wide, and assays 28 lb. to the ton. New branch lode in 60 fm. rise, 2 ft. wide, and shows several leaders of rich tin-ore; average value not yet ascertained. Stamps lode has so far yielded 36 tons of ore from a stope above the adit-level about 5 fm. west of the shaft, the assay value of which is 42 lb. to the ton. We have several pairs of tributers working in various parts of the mine at tributes varying from 12s. to 15s. in the pound."

With greater activity in the county, the paucity of skilled miners is becoming accentuated and the young inexperienced men are looking for higher pay. Forty of those employed underground at Dolcoath are said to have struck work for higher wages. The young men in question are not tutworkers, but work on owners' account (so much per shift). They complained to one of the agents that they considered the pay they were receiving insufficient. At an interview with the manager it was stated by the spokesman of the party that they wanted more pay. The manager promptly replied that they would not get it for the same amount of work as they had been doing. He reminded them that they only averaged 17 shifts per month, and that however little time they put in, the working charges of the mine remained the same as if they were working full time. If they were prepared to do what the executive of the mine had for years desired, namely, to work more shifts per month, their rate of pay would be increased in proportion. If they would work 20 shifts per month they would be paid 3d. per shift more than they had been receiving; and if they would work 24 shifts per month they would have 6d. per shift more than they had been receiving. It is since reported that all except nine of the men returned to work, and it is stated that strong measures are likely to be taken in regard to them, as the general opinion on the mine is that there is no real grievance. It is pointed out that if they work a whole month the best of them can earn £4 to £4 10s. per month, which is considered a fair wage, having regard to their experience.

On the other hand hundreds of Cornish miners have returned from the Transvaal. This, while partly attributable to the improved demand for miners in Cornwall, is thought to be also due to the partial paralysis of mining operations in the Transvaal through the shortage of colored labor, so that many new Cornish rock-drills purchased by the Transvaal mines are stored and unused through the uncertainty.

In American mines the market for Stratton's Independence shares has suffered from the influence of a somewhat enigmatical cable from the manager, which has been interpreted as pointing to a falling off in the mine. Whether this is of a temporary or permanent nature does not yet appear. Thus this company, of checkered career, keeps up its reputation for occasionally launching a bolt from the blue, giving some of the newer stockholders the jumps.

A report by Lipson Hancock, the manager of the Wallaroo and Moonto copper mines, situated on Yorkes peninsula, South Australia, is published. It shows that from 1860 to 1905 the mines yielded 1,583,530 tons of copper, to the value of £12,627,000, and paid £1,830,254 in dividends. The total expenditure was £10,770,718, and the average annual expenditure £234,150. The average yearly production was 34,424 tons, and the number of the company's employees in December last was 2,318. The report shows that the Wallaroo brand, which is noted for its purity, commands a ready sale in Europe, India, and China, and that this is the first mining company in Australia to exceed £1,000,000 in dividends.

Inspection of Copper Districts.

After January 1, 1907, the collection of copper statistics for the United States Geological Survey will be in the hands of L. C. Grafton. During the coming summer, Mr. Graton will visit the principal copper camps of the country, including those of the Lake Superior, Bingham, and Butte districts as well as the four great camps of Arizona at Clifton, Bisbee, Globe, and Jerome, and the district about Redding, Cal. Mr. Graton will spend most of the summer at Redding, but will visit the other camps en route to California or Washington, taking in the northern camps on one trip and the southern camps on the other. While at Redding he will make detailed investigations of the geology of the district.

The general geology of the Redding quadrangle has been studied by J. S. Diller, who has written the text and prepared maps for a folio of that area which will soon be published. Within the quardangle, however, are three small but very important copper areas of which special topographic maps have recently been made. These areas are the Bully Hill, Little Backbone, and Iron Mountain districts.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Eureka, Nevada, marked D. K., is Dolomite.

The rock specimen from Carrville, Cal., marked B. No. 1, is Silicious Amphibolite Schist. It contains a quantity of finely disseminated pyrite.

The rock from Carter, Mont., marked K. & Q. Co., is quartz-schist. It is very friable and to the touch seems softer than it really is. The bright, shimmering scales are sericite.

The rock specimen from Austin, Nevada, marked V. W. is quartzite seamed with veinlets of calcite. The rock contains disseminated galena and pyrite, the former predominating.

The rocks from Paris, Kern Co., Cal., are: No. 1, Pegmatite; No. 2, Rhyolite, in which there is distributed a lead-colored sulphide in microscopic crystals—so small as to be undeterminable; No. 3 is evidently similar to No. 1, but much altered. No. 4 is Quartz with a little mispickel (arsenical-iron sulphide); No. 5 is also Quartz containing pyrite and a little mispickel. It is evidently a silicified dike rock; No. 6 is typical Felsite, and contains two per cent or more of extremely fine pyrite.

The minerals from Mercur, Utah, are of unusual interest. No. 1 is Clay, not talc. This mineral will absorb water and can be puddled into a plastic mass—something that cannot be done with talc. The black coloring matter is probably carbon. No. 2 is Kaolin and can readily be reduced to a plastic state. It should be sent to manufacturers of pottery, if obtainable in large quantity, as it may be useful in manufacturing porcelain dishes, insulators and other articles. From the description given of the occurrence of these minerals, it seems likely that a feldspathic rock has been fractured, and movement has taken place along the line marked by the occurrence of the black clay, or gouge. The rock was then altered on either side to white Kaolin by the thermal waters passing upward along the fissure or zone of fracture. No. 3 is largely composed of Cinnabar, associated with calcite, which it has in part, seemingly replaced; No. 4 is principally Stibnite (antimony sulphide). There is also present native sulphur; No. 5 is apparently a much altered country rock impregnated originally with sulphide of iron, and sulphide of mercury, the iron being now altered to limonite and hematite, while the sulphide of mercury, cinnabar, remains practically unaltered; No. 6, Hematite, impregnated with disseminated Cinnabar. The white mineral in this specimen is Kaolin.

Hardening Steel.—There are at present two theories held by two distinct groups of scientists to account for the hardening of steel. These are the carbon theory and the allotropic theory. Briefly, the carbon theory holds that the hardness of hardened steel is due to the fact that the carbon exists in a hard state at a high temperature, and that it is retained in this state by sudden cooling. This condition exists only at a high temperature, and becomes unstable during slow cooling; and at a lower temperature the carbon changes into the carbide found in unhardened steel. Sudden cooling prevents the formation of the carbide and retains the carbon in the cooled steel in the same hardened state as that which existed at the high temperature. The allotropic theory declares that the action is indirect, and that, above the critical temperature, the iron passes spontaneously into a special, strong, hard brittle, allotropic state, which is unstable below that range, but that inasmuch as the passage from one state to another is relatively slow, the iron may be retained in the hard form by sudden cooling. The theory admits that the hardness is dependent on and proportional to the carbon present, and that no carbonless iron presents anything like the hardness of high-carbon steel.

So many eminent scientists are arrayed on each side of this question as to induce the belief that there must be truth in both views. The carbon theory appeals to the mind because it gives a direct tangible reason for the hardness. The chief argument against this theory lies in our ability to conceive of a substance so hard that 1% of it, when mixed with 99% of a substance as soft as iron, could produce the hardness of hardened steel.

Trade Treatises.

The Sullivan Machinery Co., Railway Exchange Bdg., Chicago, has issued a handsome little brochure on coal mining by machinery. Though small, it illustrates completely the machines and methods now used in mining coal and shows the advantages of the new system over the old. Some space is also devoted to churn-drilling and to the diamond-drill in prospecting work. It is one of the most complete small treatises we have seen.

Commercial Paragraphs.

Allis-Chalmers Co., of Milwaukee, have issued Bulletin No. 1,700 on saw-mill machinery.

The Ohmen Engine Co. is making high-grade engines at its new works on 17th and Capp St., San Francisco.

The Standard Oil Co. has ordered two Hornsby-Akroyd oil engines of 25 h. p. each, which will be shipped to Chinkiang, China, and used for pumping purposes. These engines are supplied by the De La Vergne Machine Co. of New York.

The De La Vergne Machine Co. of New York, has issued a new 82-page catalogue describing the operation of the Hornsby-Akroyd oil-engine, giving illustrations and short descriptions of recent installations of these engines. The Hornsby-Akroyd oil-engines are well known, there being over 14,000 in operation.

Automatic Cyaniding Machinery, is the title of the Blaisdell Co.'s latest publication, descriptive of their various types of mechanical devices for automatically and economically handling sand and slime at metallurgical plants. The book is profusely illustrated, showing a number of the large mines where their machinery is installed and in successful operation. It also shows interior and exterior views of the machinery in detail. Issued by the Blaisdell Co. of Los Angeles, Cal.

The Compressed Air Machinery Co. of San Francisco, whose place of business was for several years at the corner of First and Stevenson streets, has been reorganized and incorporated, with P. H. Reardon as president and general manager, W. A. Hewitt retiring. The new company is now located at the corner of Jessie and Ecker streets, between First and Second, San Francisco, where they will continue the manufacture of their Giant machine drills, the Word Bros. drill-sharpener, compressors, and other machines for mining work.

The Production of Lithium Minerals in 1905.

A mistaken impression prevailed in this country for several years that there was a large demand for lithium minerals. The result was over-production. In 1905, however, sharp retrenchment occurred, and the production fell to practically nothing. As reported by E. O. Hovey, special agent of the United States Geological Survey, it amounted to only 21 short tons, valued at $252. All of it came from San Diego county, Cal. In 1904 the output of lithium minerals in the United States had amounted to 577 short tons, valued at $5,155; in 1903 to 1,155 short tons, valued at $23,425. There were no imports of lithium salts into the United States during 1905.

The mines of Pennington county, South Dakota, which formerly produced the greater part of the lithium ore consumed in the United States were entirely idle during 1905. It is not likely that work on them will be resumed before the stocks of ore now on hand have been considerably depleted.

Practically the only minerals which have been mined as ores of lithium have been amblygonite, lepidolite, and spodumene. Amblygonite has been found in commercial quantities only near Pala, San Diego county, Cal. This region is also the only one in the country where lepidolite, or lithia mica, is produced in commercial quantities. The spodumene mines are located in Pennington county, South Dakota.

The principal use of lithia ores is for the manufacture of the carbonate of lithium, which is utilized in the solid form and in solution for medicinal purposes, especially for the manufacture of so-called lithia waters. Lithium salts are used also to a small extent in the manufacture of compounds for the production of colored fire. The metal tinges a flame with a beautiful shade of red.

The C. T. Carnahan Company, of Denver, has given a Murphy air-hammer rock-drill and dust-layer to the College of Mining of the University of California. This is a useful addition to the apparatus at the College and it does credit alike to the enterprise and the generosity of the company mentioned.

Personals.

D. M. Riordan is at Hanover, New Mexico.

John Weir, of New York, is visiting San Francisco.

H. W. Hardinge has returned to Denver from Mexico.

Juan F. Brandes was in London. He is now at Berlin.

M. E. Macdonald, of Guanajuato, is visiting New York.

Martin J. Heller is examining mines in British Columbia.

H. R. Sleeman is on his way from London to the Argentine.

Edward Skewes sails from Montreal for England on June 21.

Charles Janin is on his way back from London to San Francisco.

L. B. Davenport is now at the Mt. Gaines mine in Mariposa county.

Stuart R. Elliott is manager of the Juragua Iron Co. at Santiago, Cuba.

Emerson Gee has returned to his home in Los Angeles from Sinaloa, Mexico.

Frederick J. Siebert is examining copper mines in Fresno county, California.

H. W. Turner has been examining the Black Butte quicksilver mine in Oregon.

C. H. Karns, of Central City, Colo., is now superintendent of the O. K. mine.

J. W. Mercer has returned to New York. He will proceed to Europe shortly.

Arthur W. Stevens, of Chicago, is in Wisconsin examining lead and zinc properties.

William M. Brewer has left Vancouver on an extended visit to mining camps in Alaska.

R. A. Stewart has been appointed manager of the Santiago mines, in Oaxaca, Mexico.

E. F. Gray is mine superintendent for the Nevada Consolidated Copper Company, at Ely.

W. Lawrence Austin passed through San Francisco on his way from Arizona to New York.

Thomas T. Read has accepted a position with the Orford Copper Co., at Camden, New Jersey.

Ellsworth Daggett was in San Francisco during the week, on his way from Los Angeles to Nevada.

W. H. Trewartha-James is examining the copper mines of Phillips River, in Western Australia.

Theodore L. Lammers has organized the Mining & Engineering Development Company at Spokane.

C. M. Fueller has returned to Denver from Douglas, Arizona, where he was engaged on professional business.

F. G. Willis, of the firm of Hills and Willis, has returned to Cripple Creek from southern California and Nevada.

Frank Jenkins, mine superintendent to El Oro Mining & Railway Co., has returned from a trip to the United States.

H. W. Spaulding is now superintendent of Mekka Placer Gold Mining Co., French Gulch, near Breckenridge, Colorado.

Robert T. Hill visited Berkeley after examining copper mines in Plumas county, California. He has returned to New York.

Donald R. Morgan has ceased to be superintendent and has become consulting engineer to the Cia. Metalurgica de Torreon, Mexico.

H. L. Payne, of the Los Angeles assaying firm, The Wade & Wade Co., has gone to the Michigan copper country on a tour of inspection.

E. C. Holden is still at St. Luke's Hospital, Denver, where he is slowly recovering from the fracture to his leg, which is mending satisfactorily.

H. Vincent Wallace left Nogales on June 3, going to St. Louis and Chicago, whence he will proceed to New York, with the intention of extending his journey to England.

R. H. Burrows, of Guanajuato, will be examining mines along the line of the Kansas City, Mexico & Orient R. R. in Chihuahua and Sinaloa during the next three months.

George W. Bryant, J. S. Pattinson, W. C. Potter, W. A. Prichard, M. B. Spaulding, and C. W. Van Law are among the directors of the Mexican Chamber of Mines, just organized.

James Underhill has received the degree of Ph. D. (Doctor of Philosophy) from the University of Colorado for his work on the geology of Lower Clear Creek Valley, Colorado.

George B. Putnam, formerly with Howard Platt, at Leadville, is now associated with T. H. France, consulting engineer for The United States Mining & Milling Co., with headquarters at Mexico City.

At the celebration of the seventy-fifth anniversary of The Royal Prussian Institute of Technology, Hannover, Germany, one of the most prominent scientific institutions in the world, the honorary degree of doctor of engineering was conferred on Ernst Koerting, the noted European engineer and of the well-known firm of Gebr. Koerting, A. G. Koertingsdorf, Hannover, for his scientific researches and discoveries in gas engines and other important branches of engineering. Dr. Koerting lives in Pegli, Italy. He is interested in a number of large enterprises in the United States, among them the De La Vergne Machine Company, New York, as well as the Schutte-Koerting Company, Philadelphia, and is at present sojourning in this country.

Obituary.

George E. Otis of Redlands, Cal., a well-known jurist and mine owner in southern California and Nevada, died at his home on June 6, after an illness of several weeks. His principal mining interest was in the Cyrus Noble mine at Searchlight, Nevada.

Latest Market Reports.

Anglo-American Shares.
Cabled from London.

	June 7. £ s d	June 14 £ s d
Camp Bird	1 4 6	1 4 0
El Oro	1 6 9	1 5 7½
Esperanza	3 17 6	3 17 6
Dolores	1 16 3	1 17 4½
Oroville Dredging	0 17 9	0 18 6
Stratton's Independence	0 5 0	0 4 6
Tomboy	1 6 3	1 5 7½

(By courtesy of W. P. Bonbright & Co., New York.)

METAL PRICES.
By wire from New York.

	Average Prices for Week Ending June 7.	June 14
Lake	$18.62@$18.87	$18.62@$18.87
Electrolytic	18.37@ 18.62	18.37@ 18.62
Casting	18.12@ 18.25	18.12@ 18.25
Lead	5.75	5.75
Spelter	6.03@ 6.05	6.13
Silver	0.66⅛	0.64¾

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 10 Bacon Block, Oakland, has official reports of the following United States patents issued to Pacific Coast inventors:

822,242.—**Horse Collar Attachment.**—S. Boyer, Colfax, Wash.

822,580.—**Kiln.**—W. A. Butler, San Francisco, Cal.

822,429.—**Electric Street Indicator.**—A. J. Clark, Seattle, Wash.

822,650.—**Oil-burner.**—C. C. Cleveland, Kern, Cal.

822,825.—**Shoe Polisher.**—L. L. Clippinger, Pitchuck, Wash.

822,584.—**Bookkeeping Machine.**—M. M. Cohn, San Francisco, Cal.

822,515.—**Ore Separator.**—F. B. Finley, Los Angeles, Cal.

822,517.—**Winding Roll for Paper.**—W. B. Fleming, South Pasadena, Cal.

822,839.—**Stump and Root Remover.**—M. A. Fry, Seattle, Wash.

822,601.—**Tumbler for Bucket Elevators.**—J. H. Gray, San Francisco, Cal.

822,363 & 822,364.—**Device for Preventing Deceptive Refilling of Bottles.**—L. F. Hammer, Stockton, Cal.

822,739.—**Protective Bottle.**—J. C. Henderson, Los Angeles, Cal.

822,368.—**Gate.**—E. M. Hoagland, San Francisco, Cal.

822,457.—**Lamp Extinguisher.**—G. Kerr, Dallas, Ore.

822,378.—**Rotary Engine.**—A. S. Levake, Seattle, Wash.

822,530.—**Coupling for Glass Tubes.**—L. P. Lowe, San Francisco, Cal.

822,531.—**Manufacturing Gas.**—L. P. Lowe, San Francisco, Cal.

822,379.—**Sand-Blast Apparatus.**—H. Luckenbach, San Francisco, Cal.

822,619.—**Cool Brooder.**—N. A. Lybeck, Corning, Cal.

822,381.—**Shoe.**—R. Moos, Placerville, Cal.

822,547.—**Excavator.**—G. W. Nicolson, Mojave, Cal.

822,398.—**Ore Apparatus.**—A. Soderling, Bodie, Cal.

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EDITORIAL.

AMONG THE unpleasant incidents calling for comment, in connection with the San Francisco disaster, is the action of the Western Union Telegraph Company. The Grand Jury has made a scathing report and the president of the Company has published his reply, in which he fails to meet the charges preferred. At Berkeley the Western Union office did refuse messages, but it collected ten cents for those delivered—as the Postal Telegraph did not—and we know of many messages that were sent from the East, and paid for, that never were delivered. Furthermore, in other cases telegrams were delivered—for instance, from Los Angeles—several days after the sender arrived at the address on the telegram. Whether the denunciations of the Grand Jury are fully justified, we do not know; but we do know that the Western Union behaved so badly that it is to be regretted no fitting punishment is practicable. People are too busy to take steps to recover fifty cents or a dollar, and in any event the money involved is nothing as compared to the wrong done, alike to the individual and to the community.

ON ANOTHER PAGE we publish an excerpt from the geological report of an acknowledged authority in which the new term 'blout' is advocated and adopted. 'Blout' is to be the technical pseudomorph of 'blow out,' a term often used by miners and expressive of those large, rather shapeless, outcrops of quartz that have not sufficient length or direction to come under the designation of 'vein' or 'lode.' Blout has advantages; it should commend itself to our English friends who love compression; it reminds us of the man whose name was Sevenoaks and called himself Snooks, for short. It is first cousin to the names pronounced Marchbanks, Punsby, Sinjen, Cohoon, which are related to Marjoribanks, Ponsonby, St. John and Colquhoun, respectively, just as 'blout' is to 'blow out.' We doubt whether blout has come to stay; we hope not.

THE HEAVIEST STAMP-MILL in operation anywhere is the consolidated plant of the Simmer East and Knights Deep mines at Johannesburg. When completed it will contain 450 stamps as compared to the 540 heads of the Alaska-Treadwell. But the South African mill is equipped with unusually heavy stamps. Each one weighs 1,550 pounds and has a crushing capacity of eight tons per head; 200 stamps and two tube-mills are already at work. The big stamp-duty is due to the heavy weight of the stamps and it is not prejudicial to extraction because the oversize pulp undergoes re-grinding in tube-mills. We expect to see further additions to the re-grinding apparatus, which appears to be scant. As it is, the consolidated mill will be equal in crushing capacity to 600 ordinary Californian stamps and it will treat about one million tons per annum.

OF THE 870,000,000 pounds of copper produced by the United States last year, the mines of the Amalgamated Company yielded 216,000,000 or about 25 per cent. While the production of the entire country has increased 45 per cent since 1899, when the Amalgamated was organized, the mines of the latter have shown no commensurate increase until this year. The discoveries at the deep levels of the Anaconda and the continued productiveness of the Boston & Montana Company's mines are accountable for the improved position, as exhibited in the recent annual report. But that annual report gives little information of any value except the statistics of production, and the reports of the subsidiary companies do not help, simply because the shareholders do not know what is the holding of the Amalgamated in each case. The Amalgamated remains our standard specimen of a blind pool offering giddy chances for a gamble, but no inducement to a careful investor.

THE SCARCITY OF TIN and the probability of short supplies have caused extraordinary speculation in that metal. In 1896 the price at London was only £56, last year it reached £166 and this year, on May 14, it jumped to the wholly unprecedented figure of £215 per ton. In 1896 the visible supply was estimated at 33,073 tons and this year it has been down to 12,300 tons. The price is largely dominated by conditions in the Malay peninsula where increased cost of production and export taxes have been detrimental factors. No new sources of supply appear forthcoming. In Banka and Billiton there is a slight increase of sales. Bolivia is the only country where tin mining is undergoing healthy development, though the yield of 13,188 tons during 1905 was only 696 tons better than the year before. Meanwhile consumption is enormous and increasing. If present conditions continue, the result will be to stimulate the invention of a substitute, for high prices and uncertain supplies will surely kill the industrial uses of the metal.

NOT LONG AGO we referred to the myths that cling to that survival of discarded theories—the true fissure vein, and we suggested that instead of new definitions of a misleading term, it would be better to discard it for good. This week we are in receipt of a circular, issued by a New York promoter, in which the following statement appears: "As to the probabilities of the mines being of sufficient depth to continue profitable for many years, while there is no method known of determining this question, many men of the widest experience place confidence in the belief that the depth of pay-ore in a true fissure vein is as great as its length on the surface. The geologists, J. E. Spurr and W. Lindgren, who have been of valuable service to the Government in the researches of the United States Geological Survey, agree in stating that this belief is evidently supported by sound principle, although science has not yet discovered the cause of this phenomenon." No, the gentlemen referred to are too busy to ascertain the cause of a 'phenomenon' that does not exist or to refute an assertion which is without warrant. So we venture to do it for them. Such pseudo-science does much harm. It would be more profitable to investigate the phenomenon, presented with weary iteration, of irresponsible schemers who masquerade as experienced miners.

AUSTRALIA is prospering. Better seasons and higher metal prices have proved stimulating to agriculture and to mining respectively. At Broken Hill, the greatest silver mining region of the present day, there is much interest in the beneficiation of the zinc, both in the ore and in the vast dumps of the big mines. There has been scant progress in coarse concentration at Broken Hill during recent years; it is true the Hancock and the May jigs have been employed successfully, but the metallurgical tendency is all toward finer crushing. Krupp ball-mills of the No. 8 size have been replaced by No. 5. At the South mine, experiments with the grinding pan, as used at the Ivanhoe mine, in Western Australia, have given good results. Taking all the middling from one jig and grinding to 100-mesh, the recovery

has been increased 5 to 7.5 per cent. The manager, Mr. William E. Wainwright, expects that with pans his cost will be from 10 to 12 pence as compared to 18 pence, the cost with ball-mills. But now comes the tube-mill; for it is to be tried, there being a hope that the hard and barren rhodonite in the ore will serve to grind the softer metalliferous portion. The Wilfley table is reported to be most efficient, although the new Krupp table gives a better extraction at the expense of capacity, requiring also 350 strokes to 250 of the Wilfley.

Several large concentrators are under construction at Broken Hill. The South mine will have one of a 1,000-ton daily capacity; another of similar size is being erected for the Sulphide Corporation. A 350-ton plant at the South Blocks mine will be running in September. The Zinc Corporation has commenced the erection of a concentrator with 2,000 tons daily capacity to treat tailing and the experimental plant of this company, at the British Broken Hill Proprietary mine, is to be doubled, so as to handle 400 tons daily.

Several new processes are being put to the test. The plant erected by the De Bavay Company to treat tailing at the North mine, has been hindered in starting, but it is claimed that an extraction of 85 to 88 per cent of the zinc is assured, making a concentrate carrying 46 to 48 per cent, containing half of the silver and but little lead. The Cattermole or Ballot process is doing good work at the Central mine, the recovery being 80 per cent of the zinc and 75 per cent of both the lead and silver, so that a rich concentrate is secured. All this work will mean an important addition to the production of zinc and it is interesting to professional men as indicating another conquest in the field of complex ores.

THE MICHIGAN COLLEGE OF MINES is required by law to maintain a collection of the minerals occurring in the State and such a collection has been in course of preparation for several years. In order to render it of maximum usefulness, Mr. F. W. McNair, the president of the College, has originated a plan for lending a number of subordinate sets of specimens to such high schools of the State as give instruction in geology and its allied subjects. As the official circular says: "The object is partly economic. Obviously, the more the people in general are interested in the mineral resources of the State, and the greater the knowledge of these possessed by them, the more likely are such resources to be developed, and the greater will be the benefit to the State at large. Partly, the object is educational. In the same way that botany may contribute to the pleasure of one possessing even a slight knowledge of the plants of his vicinity, in the same way that this knowledge may add to his breadth and culture, so the knowledge of the rocks and minerals may be a powerful influence toward these ends, and may, no less than any other form of nature study, contribute toward good citizenship. The fact that nature study impresses the rule of law in the universe, is nowhere more forcibly illustrated than in the study of the crystal form of minerals, and nowhere in nature are organization and growth more clearly exemplified than in the rocks and minerals which compose the earth." The sentiment is worthy of the deed. We congratulate our friends at Houghton and more especially Mr. A. E. Seaman, professor of geology in the College of Mines, to whose enthusiastic interest in the plan and personal familiarity with the details of Michigan's resources, is credited the representative character of the collection.

The Office of State Mineralogist.

The State Mining Bureau is still without a properly appointed chief. Mr. Lewis E. Aubury is holding office without re-appointment and in daily expectation of being introduced to his successor; this condition has lasted well over a year and it is neither fair to him nor to the important office he fills. Such is the result of mixing politics with technology. When the new Trustees of the Bureau were appointed last November, the mining community had reason to hope for an excellent administration, for the men selected were representative and particularly capable of giving good service. But their efforts have been of slight avail. They found very soon that their hands were tied, even the selection of their own secretary being made without consulting them. Meanwhile it is generally known that the Trustees have selected a geologist for the office of State Mineralogist and that his name is George D. Louderback, at present professor in the University of Nevada. But the Governor, however earnest a man he may be, lacks decision; he has failed to make up his mind, as if it were necessary for him to do more than confirm a nomination made by the Trustees he himself appointed and one of whose chief duties it is to make this very selection. It is a matter of regret that the Mining Bureau should continue to suffer in its work for want of a properly accredited head; if Mr. Pardee cannot come to a decision, why not do justice to Mr. Aubury and confirm him for the remainder of the term, half of which is nearly gone?

On the other hand, we venture to refer to the selection of Mr. Louderback, in order to mention certain criticisms already made in anticipation of his appointment. It is said that he is the nominee of the geological department of the University of California, from which he graduated. Some people want a practical mining engineer to fill the post, but surely the day is gone by when an academic training is held to unfit a man for holding a State office and it seems proper enough that a geologist possessing some executive ability should be selected. As to the connection with the State University, it is most unlikely that there will be any attempt to annex the Bureau, for this would be suicidal. Both institutions are supported from the funds of the State and to use one in the interest of the other would simply invite a less appropriation at the next meeting of the Legislature. We are also informed on trustworthy authority that the Governor has delayed action because he wants "a bigger man" for the office and that it was declined both by Charles G. Yale and Ross E. Browne. Even Waldemar Lindgren's name was mentioned, as if he would resign from the United States Geological Survey to take a precarious office under the State. The Governor is a professional man when out of office and he ought to know that men of established reputation are not willing to accept a position which places them within the tangled wires of politics, and that no so-called big man—that is to say, an engineer or geologist of wide experience—will accept a post which Mr. Pardee himself is rendering absurd by his vagaries. This has been the trouble from time immemorial with such State appointments; to get a good man and to keep him, you must pay him a reasonable livelihood and he must be assured of his position long enough to perfect his organization and to bring his work to fruition. California needs a first-rate State Mineralogist—at a proper salary—a well organized Bureau, and a group of trustees just about of the sort now in office, and then a Governor who will be content to let well enough alone. And this we say without danger of any imputation of our motives in saying it.

By the Way.

In a recent issue 'The Evening Post,' of New York, says some good things about the revulsion of sentiment against certain forms of wealth.

How quickly the revulsion has come about may be gathered from the fact that it is only four years since the feast given by our 'captains of industry' was widely said to be the most impressive spectacle that America could show to Prince Henry of Prussia. Today many of these captains are variously under investigation or suspected, universities are rebuked for receiving their money, warrant-servers seek their persons, their hegemony has sunk to that of a world of graft. A 'social philosopher' declares in the 'North American Review' the inexpediency of any American citizen being permitted to earn more than the salary of the President of the nation. In short, great wealth is now on the defensive, its possession requires explanation if not apology. The virtuous scion of ten generations of clergymen or bank clerks may now turn up his nose and thank Heaven that there never was a captain of industry in his family.

Possibly the moral indignation of the have-nots against the haves is excessive. The well-to-do, and even the poor, frequently enjoy their privileged condition through no merit of their own. The salaried man who is inclined to rejoice inordinately in his superior lot should recall that only accident may have kept the golden bar sinister off his escutcheon—but for the grace of God he might be personally even as the Armours and Rockefellers. In fact, we counsel such a person not readily to give place unto wrath, but to fix his attention rather upon the blessedness of his own condition. Better be a serene retail hatter than a fevered excoriator of the Trusts. The Horatian mood retains its value, and we can imagine an entire generation of folk neither poor nor rich murmuring, "Beatus ille qui procul negotiis," with a new relish.

Certainly, the delights of the middling lot have received fresh illustration from the recent embarrassments of the unco' rich. The obscure citizen may put his Sunday quarter in the plate without fearing the echo, "Tainted money." He is not subject to the importunity of those who would force free stock upon him, but may select and buy such securities as his judgment approves; he is not liable to the harrassing debate whether his Trust should be fined or his person imprisoned; even his passions and weaknesses are safeguarded by the withholding of his annual insurance dividends, while no such fence against temptation surrounds mere insurance presidents. Finally, the average prudent man may bargain for his services without being enjoined for restraint of trade; he may accumulate "green trading stamps" without falling under the law against receiving rebates; he may kill and even can his own chicken without dread of theorists, chemists, or sociologists. To contrast with this carefree lot that of the millionaire subject, as it is, to all manner of suspicion and constraint, is superfluous.

A further and rarer felicity awaits the man who adroitly steers between poverty and riches. He may fairly aspire to association with gentlefolk—with the unheeded mass among which good manners and the older social amenities have taken refuge. What one may call the gentler pleasures of life are largely forbidden to the energetic persons who manage colossal deals of mornings and symbolically huge motors and steam-yachts afternoons and Sundays. Under modern conditions of business success, it is possible, perhaps, but most difficult, to practise the finest of all arts—that of living. We opine that these considerations should turn wrath against the financial generation now in the pillory into something like compassion. What a positive good fortune it should seem to work in a calling where ruthlessness is not the condition of success, and where the over-accumulation of money is not the goal.

To-day a wise father might well say: "Son, from generation to generation this family has earned its living and paid its bills, it has had the privilege of honest and gentle associations, no member has condescended to be very rich, none has been indecently poor, it is for you to be worthy of this tradition—to keep your family in reasonable comfort and yourself out of the committees, courts, and newspapers." That this would be good advice cannot readily be gainsaid; that it will be universally given may be doubted. Sufficient volunteers will probably be found to undertake the invidious and disadvantageous succession of the present magnates. Many more, we trust and confidently believe, will shake off the cant and cult of mammonism, readjust their standards, and come to a state of mind equally removed from sullen envy of the wealthy lower classes, and from discontent at their own humble but highly favored lot.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

It is not allowed to cut timber, either fallen or standing, on forest reserves without permit.

The United States produces more than half of the world's copper. The production of 1905 was 397,909 tons, out of a total in the world of 700,000 tons.

Where A discovers ore on land adjoining B's patented ground, this discovery does not give A any right to enter B's land to mine ore, or for any other purpose.

Steel corrodes more readily than common bar or sheet iron under similar conditions, probably due to the finely intermingled atoms of carbon present in the steel.

Those who wish to mine on forest reserves, or to cut timber thereon, should make application to the Land Office at Washington for full information and instructions.

"Roughly speaking," says Hixon, "matte is a compound of the sulphides, arsenides, and antimonides of the metals, while slag is a union of the oxides of the metals with the oxide of silicon."

The Caminetti act, relating to hydraulic mining in California, only mentions mining by hydraulic method. Whether the courts would interpret this law as applicable to other methods of mining gravel remains to be determined.

The presence of garnet in a contact zone of mineralization does not signify valuable deposits of copper ore, nor does the garnet detract from the value of the orebody. Garnet occurs in both good and poor copper mines, and abundantly also where there is no copper at all.

A mine owner, company or individual, is responsible for damage done to the property of another on the surface, due to sinking of the ground from caving or settling of mine workings. The claim that the work was done in miner-like and proper manner, will not suffice.

Any person, a citizen of the United States, or one having declared his intention to become such, whether male or female, adult or minor, may locate the unoccupied mineral lands of the United States in accordance with the Federal laws, and by conforming to the laws of the State or district in which the land is situated.

Nickel and cobalt, like chromium, are most abundant in olivine rocks, occurring as accessory ingredients in this rock, as well as in pyrite and pyrrhotite, and in hornblende and biotite to a small extent. The amount of nickel in rocks is seldom more than 0.10 or 0.20%, while that of cobalt is only exceptionally more than a trace.

Most mine and mill buildings, head-frames, and other structures about mines are wood, and therefore require special provisions for protection against fire. In view of this fact, and the heavy loss resulting from fires, both directly and indirectly, steel is being introduced in new construction and is replacing wood in many instances where rebuilding is necessary. Steel head-frames, which ten or twelve years ago were a novelty, and looked upon with disfavor by many mine superintendents, are now generally acknowledged to be superior to wood in every respect, except possibly, first cost.

The lightness of terra-cotta, its great resisting strength, its durability and its indestructibility by frost, water, and fire make it particularly desirable in the construction of large buildings. It is made from fire-brick clay in the form of hollow blocks, formed with webs inside, so as to give extra strength and to keep the work true while drying, and, in no part, more than 1 to 1.5 in. in thickness, except that to bond with brick-work, it must be at least 4 in. thick. When extra strength is needed, the hollow spaces may be filled with concrete or brick-work, which greatly increases its crushing strength. We may place the safe working strength of such blocks, in the wall, at 5 tons per sq. ft. when unfilled, and at 10 tons per sq. ft. when filled solid with brick-work or concrete. The weight of terra-cotta in solid blocks is 122 lb. per cu. ft. When made into hollow blocks, the weight of these blocks varies from 65 to 85 lb. per cu. ft., the smaller pieces being proportionally heavier. For the exterior coating of fire-proof buildings it is now considered as the most suitable material available.

Vanadium, according to the investigations of Hillebrand, predominates in the less silicious igneous rocks and is absent, or nearly so, in those high in silica. It is an ingredient of pyroxene, hornblende and biotite, but not of olivine, and is also found as an ingredient of ilmenite in titaniferous iron ores. Its amount is small, seldom over 0.05 per cent.

The following is the process carried out by the Pittsburgh & Montana Copper Co. at Butte. The matte, which averages 20% copper, is treated in a converter made of steel plates two inches thick, lined with one nine-inch course of magnesite brick; all the silica required in converting is obtained by adding silicious ores into the converter. Matte as low as 8% copper has been successfully converted, and the converter did not require to be re-lined, during the ten weeks it had been in operation.

Where compressed air is available, the small air-hammer drill may prove to be an excellent tool for use in sampling a hard vein. The machine should be provided with a moil-shaped bit, instead of that with the ordinary blunt-chisel bit usually employed in drilling. The success of the use of this device depends largely upon the practical sense of the man manipulating the machine. The air-hammer drill has proved its usefulness in rapidly drilling shallow holes, and there seems no good reason why in competent hands it should not be useful in cutting a channel of uniform depth and width across a vein of hard rock of any description.

A young man with a good public-school education, under competent instruction, should be able to learn to assay ores for gold, silver, copper and lead in from three to six months. Some pupils prove more adept than others. The first work he must perform is the grinding of the sample. The novice is inclined to consider this an unnecessary part of the drudgery of the assay-office, but it is, in fact, a most important portion of the process. One thing the beginner in assaying must learn promptly, and that is not to reject any part of the sample, but to continue grinding and screening until every portion has been reduced to pass the screen selected as suitable for the sample to be assayed.

Slow-burning or mill construction was introduced originally for cotton mills. Its motive is to reduce the fire-risk to the lowest point without going to the expense of fire-proof construction. It consists in disposing the timber and plank in heavy solid masses so as to expose the least number of ignitible corners or projections, and so that such corners may be easily reached by hose in case of fire. The floors are reached by stairways and elevators placed in a separate brick shaft, the communicating openings of each floor being closed by fire-proofed doors. Thus there is little chance of fire rising from floor to floor. The ceiling situated over inflammable materials or processes, is protected by plaster laid on wire-lath or expanded metal, this plastering following the lines of the ceiling so as to leave no interspaces.

Alcohol, or alcohol mixed with turpentine, is generally employed in blow-pipe work where gas is not available for a Bunsen burner. Olive oil is also used in blow-pipe work. When about to light an alcohol lamp withdraw the burner and wick sufficiently to permit blowing vigorously into the body of the lamp. This will remove any gas which may have accumulated therein, preventing those small and annoying explosions which otherwise so frequently occur. Any book on the use of the blow-pipe will give the necessary instructions. The flame of a lamp, or candle, is divided into three sections: a very hot, non-luminous outer portion, and a yellow, luminous portion surrounding an inner, darker part, consisting of unburned gases. This inner flame is not always visible. To produce an oxidizing flame insert the blow-pipe tip into the flame about one-third of its diameter, and a short distance above the burner or wick. The blue flame thus created is slightly reducing, but just beyond its tip is a scarcely visible intensely hot oxidizing zone, in which the mineral to be reduced must be held. To produce the reducing flame—which is yellow—place the tip of the blow-pipe a short distance from the lamp flame, and a little above its middle, and blow directly across it, turning the entire flame upon the object to be reduced.

A millman, fond of experimenting, removed the belt from a vanning machine and covered the upper rollers with a board table on which he secured silver-plated copper plates of the usual kind. He passed his mill-pulp over this vibrating table as it came from the apron-plates, and claimed that a highly satisfactory saving was the result. Why more gold was not saved on the apron-plates, he did not state. Small strips of amalgamating plate, placed on the spreader of a concentrating machine will often accumulate gold and amalgam. If the millman would carefully investigate the amount of loss, in milling, and endeavor by careful sampling of the tailing to find out where the loss actually occurs, he may in many cases be able to check the escape of gold by application of the proper remedy. Sometimes it will be found to be due to fine sulphide escaping over the vanner belt, owing to the fact that no classification of the pulp is made before concentrating. And often, it will be learned, that the loss is in the coarser sand, particles of which still inclose gold. Finer grinding is the only remedy for this condition, and the gold content of the sand may not justify the additional expense.

Stadia surveying gives only approximate measurements at best, the closest results being obtained on level ground. Where the topography is rough, errors are almost certain to occur, for, if the rodman holds the rod in vertical position absolute accuracy is impossible, though by calculating the angle of elevation (or by use of stadia tables), the distance can be closely approximated; if the rod be held normal to the angle of elevation or depression of the telescope of the instrument, the foot of the rod will not be vertically below the point on the rod intersected by the cross-hairs. This discrepancy may also be corrected by use of plummet in the hands of the rodman, but even then, great accuracy is unobtainable. Stadia surveying, if carefully done, will be very close to work done accurately by other methods, and over rough ground it is as good as ordinary surveying where particular pains are not taken, but if absolute accuracy is necessary, other means than the stadia must be employed. When about to do stadia work, the adjustment of the wires should be inquired into and if not correct, the necessary correction should be made. If the stations are more than 600 ft. apart the likelihood of error is increased.

The hardening of steel is due to suddenly arresting the progress of a change which otherwise takes place in the condition of the steel when slowly passing from a higher to a lower temperature. The metal having been completely and suddenly cooled, no further change can take place. This is accomplished by plunging the red hot steel into water. In the case of a pick, the steel point is burnished by the blacksmith—generally by rubbing on a board covered with sand. This brightens the surface of the steel. The shank of the pick still retains a high heat, sufficient to carry it down to the point. Watching it closely, a beautiful dark blue color is seen. Just at the moment this reaches the end of the pick-point, it should be given the final plunge, and the point will retain this color, dark blue, which is the best for hard rock, as well as that which is softer. Drills may be tempered in much the same way. Usually drills are heated and forged and then thrown down to cool, being afterward reheated, plunged and tempered by allowing the color to run down to the bit, but drills for hard rock should be tempered from straw to light bronze color, blue being too soft. In heating to forge or to temper, care must be taken not to over-heat the metal, as this burns out the carbon and ruins the steel for any use, and the burned end must be cut off and thrown away, causing a loss of fuel, time and material. Some blacksmiths temper rock-drills in the following manner: First, heat the bit till cherry-red, then plunge into water for a moment, till partly cooled, when it is rubbed on a stone or sanded board to remove the scales of iron oxide so that the play of colors can be seen in a dark corner of the shop. At between 430° F. and 600° F. these vary from a very pale yellow, through straw, to brown, purple and full blue to dark blue. If the cooling is uniform the colors should advance parallel to the cutting edge, otherwise that side of the bit on which the colors are moving most rapidly should be held in water a moment. When the colors move parallel with the edge (this is important to insure uniform hardness), watch until it is a straw color and quickly plunge into the water a short distance, moving it about until the steam ceases to form, when it may be left in a quenching bath, usually water, but often brine, tallow, or coal tar, which are said to vary the rate of cooling in the order given.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

WHEN CAN MINING GROUND BE CONSIDERED THOROUGHLY PROSPECTED?

The Editor:

Sir—The prevalent idea in mining is that when a block of ground has been exposed on all four sides, it is thoroughly developed. But is this always the case? In ordinary veins of medium grade ore, where the average runs rather evenly, as in those of South Africa, the rule may be safely followed; but in pockety lodes, or veins that are much faulted and altered, it may be well to consider the exception.

If all the data available could be brought together, I believe it would be found that the exception is much more common, for worse as well as for better, than is generally supposed. I recall a number of instances of ground being abandoned as thoroughly prospected, where it was found, later, that a few feet more of work would have reached the desired pay-ore. I judge that all mining men can recall some such experience; but I believe the one that affords the basis for this article is unique, and it is a personal experience.

A section of the mine worked had, supposedly, been thoroughly prospected, and all ore that paid expenses, and quite a lot that did not, had been stoped out; this part of the mine was therefore abandoned, two years before the mine was finally shut down and sold for a nominal sum. Several pillars were left in this ground, but on no side did assays show milling ore, and it was sampled every meter.

In the particular pillar I have referred to, FDE (see Fig. 2), was the main working level, and the ground had been stoped out above this level. When the time came for prospecting the ground below, a winze was started at F, the most likely spot; and this was sunk 25 ft. At this depth the vein was faulted, as shown in Fig. 3. A cross-cut was run from the foot of the winze, 30 ft. into the hanging-wall rock, and the vein cut again, at this distance. From this last point a winze 25 ft. deep was sunk on the vein to A (see Fig. 2). These two winzes were sampled every meter, nowhere showing pay-ore; most of the ore being practically barren.

The vein was about three feet wide. At A (see Fig. 2), a drift was run each way; to the north, but a short distance; but to the south, it was run 60 ft.; the ore, throughout, being very low-grade. At 60 ft. a raise was run 20 ft. and the drift continued on this level 40 ft.; connecting with stope Z. Here we had a pillar stoped to the limit of pay values on two sides, and developed on the other two sides by winze and drift. Following the rule, the block being small, it was left intact, as valueless.

Two years later, as stated, the property was sold. The purchasers, working on a smaller scale, milled the filling and old dumps, mostly at a loss. Nearly two years later still, when they were $130,000 "in the hole," they opened up again that part of the mine now under discussion, in hopes of finding filling or ore that would pay. In sampling the ground at C (see Fig. 2) a sample was taken of some rock that had fallen from the roof, and as this assayed about $10 per ton, they started to stope, the ore improving as they went up. Within 12 ft. they had five feet of very rich ore.

The result was, that they took out nearly $300,000 gold, within 40 days, from a pocket lying as shown in Fig. 2. Nowhere was it over 23 ft. wide by 55 ft. long, by the width of the vein, three to five feet. The remainder of the ground turned out about as shown in Fig. 2. The faulted end was raised to the level of the drift FDE, and about 40 ft. over. No ore of value was found in the fragment between FDE and the fault PP' (see Fig. 3); all the richness being bunched (with a vengeance) in the other fragment P'C.

Noting the above, the question arises: Does development on four sides prove the value of a block of ground? And this leads to another: When should a mine be abandoned? These are vital questions that often force themselves upon us, and leave their answer to our co-workers, or to the peers in the profession, whose ability and larger experience may have caused them to come to some conclusion in regard to the matter. For myself, I am almost inclined to follow the Irishman's advice: "Always drive 10 ft. beyond where you stop." In stoping, this would mean, knock it all down.

E. A. H. TAYS.

Fuerte, Mexico, May 10, 1906.

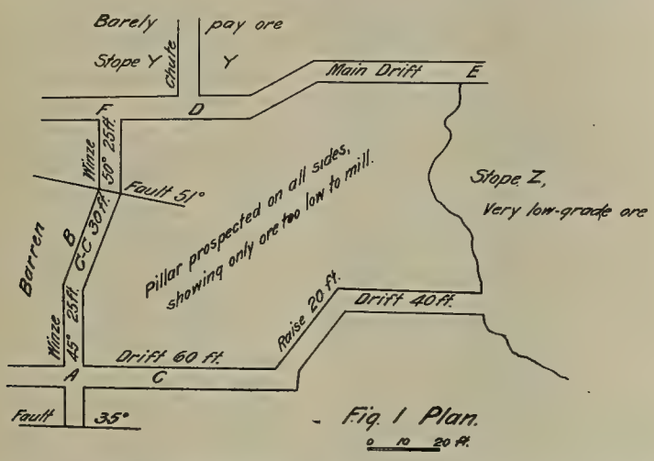


Fig. 1 Plan.

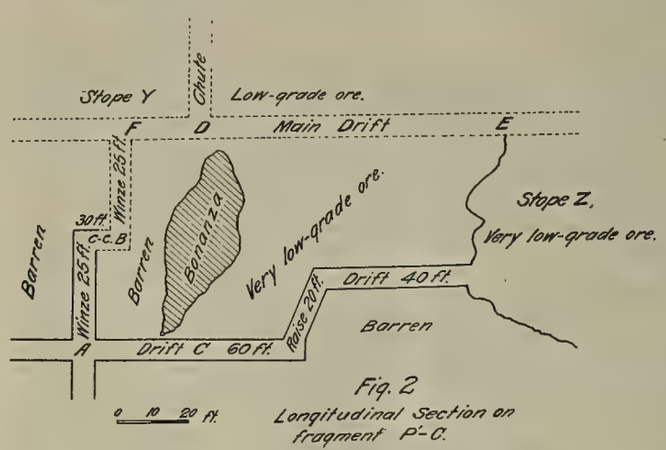


Fig. 2 Longitudinal Section on fragment P'-C.

LODE-MINING IN ALASKA.

The Editor:

Sir—I noticed in your issue of May 12 an article on this subject, written by Mr. Chester W. Purington, which in my judgment does not do justice to that Territory. I have been frequently charged with pessimism myself, but the pessimistic tone of Mr. Purington's article was so pronounced, and the descriptions so general that I am prompted to take up the cudgels in behalf of Alaska, in so far as lode-mining is concerned.

While I must agree with Mr. Purington in many of his statements, yet it strikes me that he has not made due allowance for the unfavorable conditions which exist in Alaska, many of which are not found in any other mining region in the States. For instance, although much of the coast-line can be prospected from boats, it is due to the average prospector to recognize the fact that a man coming from the interior is badly equipped to manage small boats on the Alaskan waters, where the tides, currents and winds create conditions such as even thoroughly experienced sailors often fail to contend against with success. Consequently, before any prospector should think of following his calling in Alaska, it is requisite that he be a fairly good sailor himself, or else be accompanied by one.

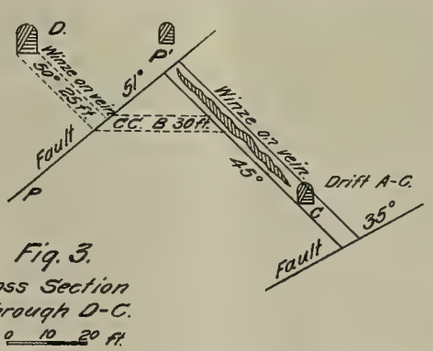


Fig. 3. Cross Section through D-C.

Another difficulty the prospector has to overcome is the heavy growth of underbrush including sallal, devil's clubs, manzanita bushes, to say nothing of the fallen timber which often is so thick on the ground that a man is kept continually climbing over it, rendering it impossible for him to travel more than half or three-quarters of a mile in an hour. Then again every prospector has to pack on his own back his supplies, bedding, etc., whenever he leaves his boat to penetrate into the wilderness. Finally, natural rock-exposures are scarce, except at high levels. Even in the creek-beds it is a rare occurrence to find rock in place exposed; consequently every prospector has a great deal of difficulty in finding veins, even after he has found float.

As it is my desire to make this communication as brief as possible, I will drop the subject of unfavorable factors right here and go on to a discussion of the actual conditions as they exist today with regard to the development work at present being carried on. Mr. Purington gives due consideration to the operations at the Alaska Treadwell Co. in Juneau district, but does not mention the fact that the Jualin mine was being operated during last season and that a new orebody had been discovered which yielded about $20 per ton by amalgamation, together with about one per cent of concentrate, carrying $150 per ton. This orebody is known to be 350 ft. long and 5 ft. wide near its apex, which is about 100 ft. below the surface. The drift from which the ore was taken last season had been driven within about 30 ft. of the apex and during the past winter sinking has been done in order to properly develop this orebody.

Neither does he mention the Eagle River mines, on the coast, about 30 miles from Juneau, which have been successfully operated now for the past two years and promise to yield valuable, even if not extensive, orebodies. However, the high grade of the ore, the persistency of the shoot, the accessibility of the mine, and free-milling character of the quartz warrant the assertion that this property is the peer of many successful mines in other portions of the United States. The Alaska Perseverance property in Silver Bow basin, about four miles from Juneau, is being operated continuously, and although no ore is being milled at present a 100-stamp mill is being erected, and the development so far done warrants the assertion that within a reasonable time, the product from this mine will be of sufficient importance to place it among the big properties of the States. This is another that Mr. Purington fails to mention. Of course the properties on Berner's bay, known as the Nowell mines, which have been in the hands of a receiver for several years, can hardly be taken into consideration at this time, but should certain negotiations which are now pending be carried through, it will not be long before this will be added to the producing mines in the Juneau district.

When the other portions of the Alaskan coast are considered it is quite true that up to the present time there may be said to be only two districts which give promise of becoming of any importance. These are Prince of Wales island and Prince William sound, with the islands adjacent. While Mr. Purington is correct in stating that both these districts have failed, so far, to make any appreciable production, yet it is a fact that while on Prince of Wales island in March 1905 there were only about 50 tons of ore being mined per day. During the visit I made in April 1906 I found this product had been increased to about 400 tons of copper-bearing ore per day and the number of properties on which serious development work was being performed had been increased from two, which was the total in March 1905, to eight, as follows: The Stevenstown, owned by the Hadley Consolidated Mining Co.; the Mamie, operated by the Brown Alaska Co.; the Mt. Andrews, by the Britannia Smelting Co.; the Rush & Brown, operated by the Alaska Copper Co.; the Khyam, by the Omar Mining Co.; the Niblack, by the Niblack Copper Co.; the Jumbo group, by the Sulzer Industrial Co.; and the Copper Mount, by the Alaska Copper Co. In addition to these properties, there are several locations on which development work is being done in

earnest and many of these promise to be shipping propositions within the next year or two.

In the Prince William Sound district there are only the Beatson property, on Latouche island, and the Gladaugh mine at Ellamar, which have made any regular shipments, although sample shipments have been made from a property on Landlock bay, also from a claim situated on the east side of Latouche island. During the present season serious attempts at development are being carried on by the Reynolds Alaska Development Co. on properties on Boulder bay, also on Latouche island; the Girwood Syndicate is developing another property on Latouche island which is held under bond; James Buzard and the Hemphell Syndicate are developing properties which are considered to be extensions of the zone on which the Beatson property is situated. In addition to these there are a number of prospectors who are regularly performing assessment work on mineral claims situated on Galena bay, Landlock bay, Boulder bay, Fidalgo bay and other points along the coast-line of Prince William sound, as well as some of the adjacent islands.

When the fact is taken into consideration that until after the Klondike excitement in 1898 no prospecting had been done along the Alaskan coast for veins except in the Juneau district, and the difficulties to which I have referred are considered, together with the fact that it has been almost impossible to obtain capital in any considerable amount to work properties along the coast, I am of the opinion that the progress has been fairly good and although it will not compare with the rapid growth in Colorado, yet when the conditions at present prevalent in Alaska are compared with the conditions as they were during the early history of most any of the western mining States and Territories, I think it may be said that Alaska has not been so remarkably slow.

If Mr. Purington's conclusions as to the poor future for lode-mining in Alaska are based on the geological conditions, then all I can say is that with the exception of British Columbia, the geological conditions with regard to the occurrence of copper, are unique, in fact I do not know of any other mining region where parallel conditions prevail. Development work alone will prove whether the lode mines of Alaska are destined to be of any consequence.

WM. M. BREWER.

Vancouver, June 9, 1906.

THE TREATMENT OF DESERT ORES.

The Editor:

Sir—I have read Mr. Bosqui's article in your issue of May 26, in reply to one of mine in your issue of April 28, and crave space to rectify a few points.

The term 'desert ore' was not used by me as a term of classification of ore; it meant simply ore found in desert regions, and referred particularly to the conditions of treatment there. I did not refer specially to Mr. Bosqui's installation of the Combination mill or to the ore of any particular district, but referred generally to the treatment of soft oxidized ores. Mr. Bosqui's description of the Combination ore, as one in which the oxidized portion is much harder than the sulphide ore, shows it to be an unusual occurrence.

"The latest and best practice in cyaniding" quoted by Mr. Bosqui, would be more correctly termed the "last fashion in cyaniding in South Africa." It is notorious that what was called "double treatment" was boomed some years ago in South Africa, and in consequence a number of double-treatment plants were installed in this and other countries; and they were failures. More recently, the South African practice was to divide the pulp into 'sand' and 'slime' to be separately treated, and this appears to be the ideal treatment for "every modern mill operating on a logical basis," according to Mr. Bosqui. The most recent practice, however, at Johannesburg, is to fine-grind and filter-press the whole pulp, and thus get "one product in one operation," the advantages of which are most clearly and interestingly shown in the abstract of Messrs. Denny's article given in your issue of June 2.

I shall not take up space by replying to Mr. Bosqui's statements on ore treatment seriatim, but I must traverse one statement regarding "the impossibility (from an economic standpoint) of reducing ore to a sufficient fineness to ensure the best recovery" by referring to the fine-grinding of cement-clinker, which is done on an enormous scale and at a low cost.

It appears to me that the "best practice" is to be able to interpret laboratory results on any ore, so as to install the kind of plant economically best suited to its treatment, without reference to what may be the practice in South African or other fields, otherwise than to take advantage of new discoveries in grinding machines, etc. In the case of porous oxidized surface ore it appears to me that the best practice would be to crush dry to a fairly coarse mesh and leach direct in vats, the residue being subsequently passed over amalgamating plates or concentrators, if found to pay. In the case of ore which requires fine-grinding to release the metals, I would fine-grind either dry or with cyanide solution, agitate and filter-press the whole pulp, thus getting "one production in one operation." The point on which I wished to lay most stress was that when cyanide is used at all, it is more logical to treat with cyanide first and amalgamate (when necessary) afterward, than to follow the ordinary procedure.

Finally, I wish to deprecate most strongly the introduction of the personal element, as so patently shown by Mr. Bosqui. I take it, these discussions should be purely impersonal and for the advancement of the art of metallurgy and the interest and instruction of your readers, but not for the ventilation of any personal feeling between professional men.

BERTRAM HUNT.

San Francisco, June 9, 1906.

PROTECTING WATER-PIPES.

The Editor:

Sir—In response to a query appearing in your issue of May 26 in regard to protecting water-pipes in a cold climate, I have found that good results have been attained by burying pipes and disregarding the circumstance of maintaining a uniform grade to attempt draining at one point. It is not a difficult matter to use couplings in depressions and to disconnect them at these lowest points at the beginning of cold weather. I have seen pipes drained (where no convenient couplings permitting the above practice were used) by simply starting a leak by drilling a hole or otherwise. Where moderate pressures, say, to 150 lb. per sq. in., are carried, this seemingly primitive method works well; but where heavy pressure is withstood, the better practice is to use an easily disconnected bolted coupling. When pipe must be kept above ground, a good method is to cover it with a box of square section and of such dimensions as will permit a filling (between the pipe and its boxing) of several inches. This filling, of sawdust, straw, or other similar non-conducting material, will furnish an efficient and cheap protection against low temperatures.

Earth is a most efficient non-conductor, therefore the practice generally in vogue in cold climates includes the burial of pipe-lines. Not only is protection against freezing afforded (if pipe-lines are kept full all winter) but another valuable result is secured, namely, the pipe is held firmly, no movement being permitted even on steep slopes.

J. P. H.

Berkeley, June 14, 1906.

A TRUE STORY.

The Editor:

Sir—This is a little history of an occurrence in connection with an immensely rich mining company in central Mexico, which would make much more interesting reading to the mining fraternity if names could be used.

Sancho was a little man, a keen eyed little man, and being a Mexican, he had Mexican ideas of 'mine and thine.' One of them was to get ahead of the English mining company that had come in upon his land. When the company required a part of his farm for a tailing pond, Sancho suddenly developed great business ability, and for land that had hitherto been worth about thirty-seven cents an acre, he wrung out of the corporation the sum of five thousand dollars. His Mexican neighbors were all elated over this success, and Sancho was forced by the laws of Mexican propriety to give an ox-roast or barbecue in celebration. As time went by Sancho settled comfortably down to a life of ease, although he still continued to work his shift in the cyanide-plant. He knew the value contained in the hundreds of tons of tailing and solution that were thrown out daily. These had been accumulating on the land which he had sold to the company and the solution had been seeping through them, forming a small rivulet which ran through the canyon traversing his remaining acres of rocks and brush, dealing death and destruction to the animals that drank of it. Quite frequently Sancho lost a cow, a burro, or a horse and the company grudgingly paid for them their full market-value. Finally Sancho suggested that with their permission he would box in the stream and carry it entirely across his land if they would save him from damage-suits which might be brought by his neighbor next below. Permission was given him and Sancho lost no time in carrying out his plan. There was continuous travel over Sancho's new launder but no one suspected what he had so carefully concealed at one place in the launder; he dreamed on in his quiet way, and continued to build up his fortune. The stars might have told a tale but they blinked merrily at the joke and shed no light upon the subject. When all was quiet save for the roar of the mills, Sancho stole under the cover of darkness to his zinc-box which he had most craftily concealed in the shady part of the canyon. Listening carefully for any footfalls he would slip the cover off the zinc-box and proceed to clean up. These clean-ups would often amount to 500 pesos in less than two weeks. And so he continued for about two years, until he became so bold as to ship his bullion by express instead of selling it at a heavy discount, as he had hitherto done. The shipment was of course reported by the express agent to the general manager of the company, who lost no time in investigating its source and then in installing boxes of his own. Although a very considerable amount of bullion was secured to add to the monthly clean-up of the big plants, strangely enough it was not itemized nor was it mentioned in the report to the London stockholders.

While Sancho was being interrogated regarding the quantity of bullion he had already secured, he stoutly maintained that this clean-up was only the third he had made. Realizing that he was not liable to arrest, and that the officers of the company were not anxious to have the matter made public, he took heart and at the same time took the manager into his confidence and exhibited his bank-book with much pride, pointing out with care and voluble explanation the monthly entries totaling five figures.

GAMBUCINO.

Mazatlan, June 9, 1906.

A DISCLAIMER.

The Editor:

Sir—My attention has lately been called to a circular issued by The Mitchell Mining Co. of Arizona, in which I am quoted as endorsing the property at La Dicha, State of Guerrero, Mexico, to the extent of some 8,000,000 tons of ore having a value of some $57,000,000. I wish to deny absolutely ever having made such a statement by letter or verbally. My examination of the property in January, 1905, showed 1,800,000 tons of ore that can only be smelted, averaging 1.86% copper, traces of gold and silver.

Trusting you will find space in your esteemed publication for this statement, I am, etc.

T. H. FRANCE.

Mexico, D. F., June 1, 1906.

Two parts of aluminum and one part of zinc form an alloy to which has been given the name 'alzene.' It is equal in strength to good cast iron and superior to it in the matter of elastic limit. It takes a fine, smooth finish and does not readily oxidize. The color is silver white. It melts at a low red heat and is very fluid, running freely to the extremities of the mold and filling small or thin parts. Great care must be exercised in melting it, particularly when mixing the two metals, in order to preserve its smooth working qualities. It is somewhat brittle and hence unsuited to such pieces as require the toughness possessed by brass. The tensile strength is approximately 22,000 lb. per sq. in. and 3.3 is the specific gravity.—From 'Engineering News.'

A Great Gem Mine.—The sapphire workings at Yogo gulch, Montana, are being gradually developed into a great and permanent industry. The Yogo dike is perhaps the greatest gem mine in the world. It is four miles long. It is estimated that the workable sapphire-bearing rock would approximate 10,000,000 cubic yards. A mining plant is being erected there which will quadruple the previous output and make Montana sapphire mining an important factor in American gem production.

The stones are not of large size. They range from 'culls,' used for watch jewels and other mechanical purposes, to gems averaging, when cut, from half a carat to 2 or 3 carats and rarely up to 5 or 6. As gems they are brilliant, free from flaws and of good color, ranging from light shades to the rich, deep blue of oriental sapphires. The Yogo crystals have an advantage for mechanical uses over East India stones in their form, which is largely short prismatic or rhombohedral with flat basal terminations, and hence they need much less cutting for such purposes as watch jewels. The gems are sent to Amsterdam for cutting, and yield from two-fifths to one-half that weight of finished stones.

The Milling of Gold Ores in California.

Written for the MINING AND SCIENTIFIC PRESS by
W. H. STORMS.

In all probability the first gold mining to be done in the United States was in the gold region about Dahlonega, Georgia, or in the Carolinas, unless it was in some of the gold districts in southern California. Although the discovery at Sutter's mill, on the American river, in El Dorado county, California, was that which attracted the attention of the entire civilized world to California as a land of gold, it is well known that in Los Angeles county, and probably also in San Diego county, gold was washed from the placers by Mexicans and Indians long before Marshall's fortuitous discovery at Coloma.

From that day to this, California has not ceased to be recognized as a region of rich gold mines, nor has she proved disappointing. The golden output of California has reached nearly fifteen hundred millions of dollars.

California was the first school of gold mining and milling, and California practice, based upon the crude, almost barbaric methods of the Old World, came to be looked upon as exemplifying the best practice.

From oft-repeated praise the California millman, in time, really permitted himself to believe that he had actually attained an exalted plane. He became wedded to his practice, and, as he drew the lines still tighter, he grew more inflexible in his views. Innovations he abhorred, contenting himself with the results of his own limited experience. As years rolled by the early novice became the so-called old California millman, and a more autocratic (and we might also say automatic) individual has rarely existed. His judgment in milling matters was final; his word was law. "I have been running this mill for the last 30 years," he has been heard to remark, with ill-concealed conceit, "and you can't tell me anything about it."

When a man has been in one mill for 30 years, and nowhere else, it is about time for him to retire in favor of a younger man. Broad views and extensive knowledge do not come to those who get into a rut, and remain there for 30 years.

That the boastful millman did not always really achieve the high success he claimed is abundantly proved by the value of the tailing piles throughout the State, many of which have been re-treated by cyanidation and by other modern methods, at good profit.

For the most part, the ore of the gold veins of California is remarkably amenable to treatment by amalgamation, followed by concentration. This is the common practice throughout the State even today, and with rare exceptions, the tailing, after all, still contains a noteworthy quantity of gold, the greater portion of which should have been recovered in the mill.

The ordinary method of treatment is still much after the style of the ancient millman. The ore is delivered at the top of the mill to a breaker, though a few of the better equipped plants have the rock-breaker at the shaft or tunnel, or at some convenient point intermediate between the mine and the mill. From the bins the broken ore passes to stamps, the few exceptions being in the form of Huntington, Kinkead, or other type of rotary mill. The screens vary in mesh, but owing to the desire for large capacity per crushing unit, they are generally too coarse. The inevitable result is, in a large majority of cases, that the ore is not crushed sufficiently fine to release the valuable mineral from the gangue.

From the battery the pulp passes over silver-plated copper plates, often too limited in superficial area to accomplish the best results.

There have been volumes written on the amalgamation of gold-bearing ores. The experienced amalgamator has learned, if he has had his experience in more than one mill, that all ores cannot be treated in exactly the same manner. He must vary the amount of feed water, and the 'quick' must be fed according to requirements and not according to any rule. The ore from the same mine frequently varies in the different stopes, being more free in certain parts of the mine. Some ores may be crushed much coarser than others, without interfering with a satisfactory extraction by amalgamation. It is often a good idea to make experiments in the several batteries of a mill to determine what screen is best suited to the ore under treatment. It happens not infrequently that by employing a finer screen and lowering the discharge from two to four inches, a higher percentage amalgamation may be secured, while not reducing the capacity of the battery.

Another matter which requires careful attention is the feed of the battery; it should be adjusted and then watched to see that it is constant. Dry ore will usually run more rapidly than that which is wet. If the automatic feeding machines get out of adjustment, as they sometimes do, changes at once occur in the battery, on the plates, and on the concentrators. One of the fundamental principles of successful gold milling is an even feed of water and of ore. When these are secured a uniform set of conditions is established, and the duties of the mill crew are reduced to a minimum.

Extremists in the gold mill do not accomplish the best results. One feeds too much water or too much ore, or both, with too much or too little quicksilver. It is the rational, thinking man who does the best work. He watches his mill—every portion of it, and sees that each piece of machinery is properly performing its function, and also that the millmen each assume a proper share of the duties. It is a mistake to think that all that is necessary is to turn on the power and the mill will do the rest. Careful watching is needed even in the most automatic mill.

From the battery the crushed pulp falls upon the plates. There are many curious notions about the outside plates. These are too numerous to mention, but there are a few points worthy of emphasis.

The grade of the plates must be adapted to the ore, for the reason that it is not possible always to adapt the ore to the grade. The amount of water fed should be that quantity which will carry the pulp over the plate in a thin, even stream, allowing no bars of sand to accumulate. The water should be fed from a tank and be under constant head, or it will not supply a uniform amount. It is important to have abundant plate surface. Careful and exhaustive experiments made in the Homestake mills at Lead, South Dakota, have proved unmistakably that it pays to have large plate area. In those mills there are over 300 sq. ft. of silver-plated copper plates to the battery of five stamps —an unusual thing in any California mill, where the plates seldom exceed 80 sq. ft. per five-stamp battery, and are usually much less.

To accomplish the best results the plates must be kept in good condition constantly, and dressed as often as they require it. The condition of the plates is one of the most important factors in the free-milling of gold ores.

In most California mills, from the plates, the pulp, now supposed to be deprived of the greater part of the free gold content, is conveyed by launder to the concentrating machines, usually two for each battery of five stamps, because this is the common arrangement, and not because one may not be enough, or that more than two may not be necessary.

The pulp stream from each battery of five stamps is 'split' on a wedge-shaped wooden block placed on the launder, one-half going to one concentrator, the remaining half to the other machine. There is usually no difference in these machines, nor in their grade, speed, or amount of water employed, nor should there be, in consideration of the fact that there is practically no difference in the pulp going to either machine.

The fact was recognized many years ago, in Europe, that concentration of the minerals of high specific gravity from the lighter gangue minerals could not be accomplished successfully by a single operation upon one machine. In crushed ore containing sulphides of the base metals, or other valuable minerals of relatively high specific gravity, some of the ore particles, as well as the gangue, are coarse and some are fine. These grains range in size from the coarsest particles that will pass the screen spaces after crushing, to those of microscopic minuteness.

The relative size of the grains to be concentrated, and also the shape, are important matters. In the first place, the ore must be crushed sufficiently fine to liberate the grains of valuable mineral from the gangue. Having reduced the ore to the proper fineness, no matter what that may be, there always exists a wide range in relative size of these particles, and the problem is to separate both the coarse and fine and all intermediate sizes of valuable mineral from the coarse and fine and intermediate sizes of the particles of gangue. This is the problem of the concentrator man, and it has been solved almost to perfection, but not by the self-satisfied old-time millman. True, he has undertaken some improvements on the simple division of the pulp, and distributing the stream equally to the tables. He has first passed the pulp over a Wilfley or other table and then sent the tailing from this table over some of the numerous belt machines, such as the Frue vanner. This has been found an improvement in some mills, but the idea is still far from the proper method.

Another manner of improving the ordinary concentration methods in California practice is that of concentration in the usual way on two machines to each five-stamp battery, adjusting the machines so that they will save all of the sulphides—a difficult thing to accomplish, but a large percentage may be secured by saving at the same time a part of the sand liberated from gangue minerals. This dirty concentrate is then run over an extra machine for re-cleaning, and much of the sand is thus got rid of; but this operation always carries over some of the finest sulphides, and the result is not what had been hoped, nor, indeed, what is usually claimed for it.

As previously stated, the shape of the particles of both sulphides and gangue minerals is of great importance. In veins occurring in, or accompanied by, slate and schist there is often found a flat, flaky sulphide of iron, usually lower in grade in precious metals than that in the quartz, and yet too good to be thrown away. No concentrator made will save all of the granular sulphides and the flaky sulphides of the same diameter.

Panning after concentrators may not show the presence of sulphides in the tailing, and the millman is led to believe he is saving all that is valuable. This is because a first-class concentrating machine will do better work than is ordinarily done by panning, but the assay will detect the loss in the tailing from the machine.

At many California mines, the fact that these losses occur despite the best efforts of the millman has been long since recognized, and an effort has been made to curtail this loss by constructing elaborate slime-plants, consisting of an extensive series of inclined planes covered with canvas. In most cases a rude attempt is made at hydraulic classifying, in boxes of varied shape, but too small to effect proper separation. From these boxes, or classifiers, the coarse material passes out at the lower aperture, the fine overflowing at the top. It is the latter that is sent to the canvas tables, the coarse material from the bottom spigot being allowed generally to flow to waste, though still containing some gold.

Owing to the character of most of the California gold ore, there should be no use for the canvas slime-plant, if the proper sizing and hydraulic classifying arrangements were made between the crushing machinery and the concentrating machines.

If the stream of pulp from the amalgamated plates be sent to a pointed box or sizing cone, of proper size, where the coarser material passes out at the bottom, and the finer, slime-like portion overflows at the top, these two streams of material may be sent to separate machines of suitable design, and run at a speed determined by experiment as the most effective for the purpose, far better results would be accomplished.

The hydraulic-sizing device may be a plain settling cone or it may be provided, like the spitzlutten, with an upward current of water, which makes the separation of the coarse from the fine still more complete.

If the fine grains and slime containing both gangue and sulphides appear to require closer classification and separation this material may be passed through a second and larger classifier and three products made instead of two. Each of the several grades of classified material must be treated on a concentrating machine found by experiment to be adapted to it. The result will then be a high saving of the gold in the ore, with a consequent increase in profits; as the entire plant, when properly arranged, will be automatic.

Freiberg. According to E. V. Sturdy, attached to the British legation at Dresden, the considerable loss shown on the working of the mines is due principally to the approaching exhaustion of the silver and lead orebodies in the neighborhood of Freiberg, the result of the year's working being estimated at receipts, £42,800; expenses, £99,475, or a loss of £56,675, almost precisely the same result as the estimates for 1904-05 allowed for, though in each of those two years receipts were estimated at £55,035, and expenses at £121,535. The number of persons employed at these mines, which at the beginning of 1904 amounted to about 1,900, will by the end of 1907 be reduced to 1,300. If it were not for the renowned School of Mines established at Freiberg, whose students, drawn from all parts of the world and numbering many young Englishmen among their body, gain their experience in practical mining from underground work in the State mines; it is probable that by this time they would have been almost entirely abandoned, for, although the production of silver may still be reckoned at some 290,000 oz. annually, the cost of extracting this quantity is out of all proportion to its value.

From Australia comes the proposition to employ mica for the powder chamber of cartridges. The alleged advantages are that the quality of the powder could be judged through its transparent covering; that on account of the resistance of mica to heat the temperature of the gun would not rise so rapidly with firing as is the case when ordinary cartridges are used, and, finally, that in employing mica cartridges it would never be necessary to grease the breach of the gun.

Mining With the Steam-Shovel.

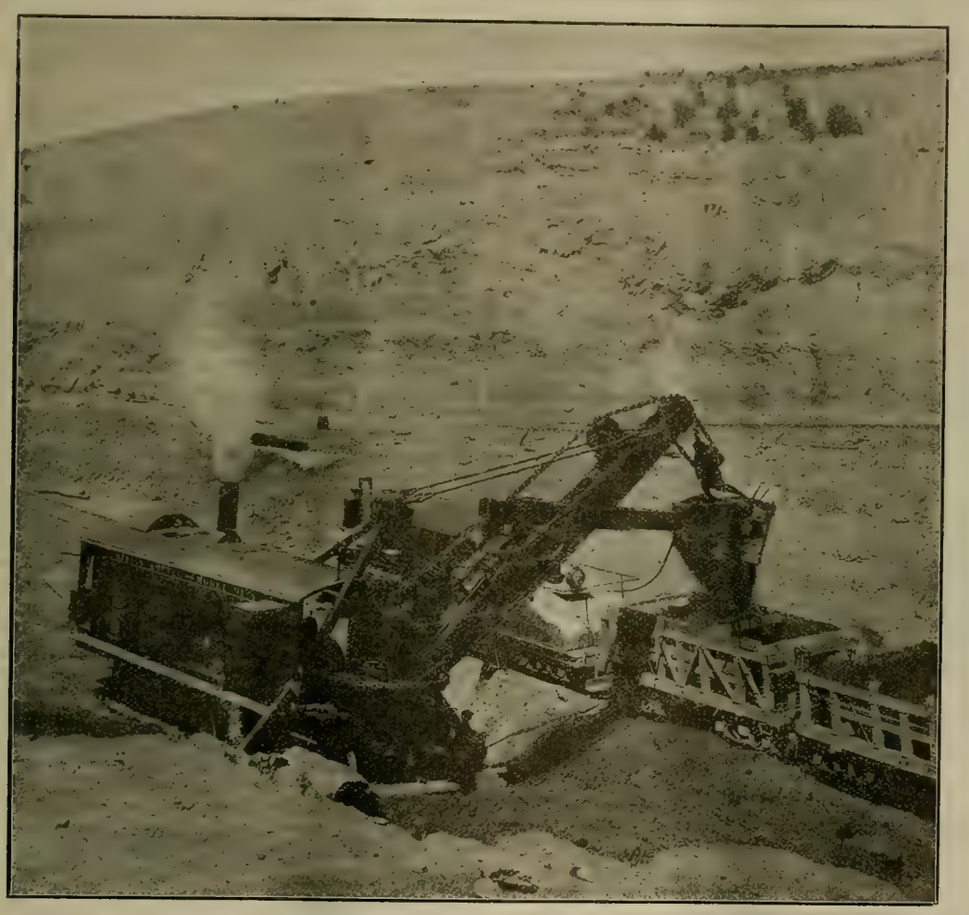
Written for the MINING AND SCIENTIFIC PRESS by DWIGHT E. WOODBRIDGE.

Mining iron ore by a steam-shovel is no peculiarity of the great Mesabi range, though it is generally so regarded. The development of that somewhat spectacular method on the Mesabi range has been so extensive and rapid that it has come to be regarded as typical of the district. Ore was mined by steam-shovel on older Lake Superior ranges long before the Mesabi was discovered, though only in a small way; it was the tremendous tonnages to be handled on the new range, not alone of ore, but of overburden, that caused the development of the steam-shovel in mining as it is at present.

When mine operators were confronted with the problem of opening the flat, comparatively shallow and quite soft ore deposits of the new range, all their previously acquired experience was at fault. Something new was demanded. The earliest experiments with a steam-shovel on the Mesabi were made by John T. Jones, a skilful and daring operator of the Menominee range, backed by P. L. Kimberley, of Pennsylvania iron-making fame. Mr. Jones had the proper idea, which was that one could go to far greater expense in stripping overburden than was admitted by most miners, if there were a sufficient thickness of ore beneath, and his plan of work on the Biwabik mine contemplated considerably more than the 40 to 50 ft. of stripping then considered safe. He was also alive to one very important factor of the situation—that there should be ample room to move cars away from the stripping and mining shovels; in other words, that the space on which cars and trains could move must be so great that there would be no serious delays in getting them to the shovels for their loads nor away when once loaded. One chief cost in steam-shovel operations has always been that of delay to the machine itself, handled as it is by skilled and expensive labor, while it is waiting for locomotives to get loaded cars out of the way and while empties are being spotted for their loads.

It is in this very point that the new plans for handling some of the large copper deposits of the West by the shovel will show a weakness, and fail, if they fail at all. For it is one thing to manipulate a train of dump-cars on a level space large enough for the entire train to be moved at once, passed along in front of a stationary shovel and loaded singly as they pass by; and quite another to get cars to a shovel placed on the side of steep arroyos, where there can hardly be room for turn-outs, and where everything must be handled from one end and over difficult grades.

Beginning with shovels not particularly adapted for the special requirements of the Mesabi situation, built by men not intimately acquainted with the difficulties to be overcome, the entire business has become highly characteristic, and is now as efficient, in all probability, as such a business can well be, considering the necessarily wasteful type of machine used. The shovel itself has become larger and stronger in many straining parts, auxiliary engines for special duties have been added, the booms have been adapted to the requirements of lifting to certain heights, to make a wider sweep, or dumping to a greater distance, and the shovel as a whole has become more and more self-contained. Some mining companies on the Mesabi are using a shovel weighing 105 tons and capable of lifting a dipper-load of six to eight tons, but the majority of machines in use are much smaller and lighter. In its large order for shovels last fall, the largest ever given by any private concern, the Oliver Iron Mining Co. fixed upon a weight of 90 tons for the machine and a capacity of 2.5 yards in the dipper. A yard of ore weighs about two tons. The Mahoning Ore & Steel Co. uses a shovel of about 65 tons weight and 1.75 to 2-yd. capacity. The Stevenson uses a 105-ton shovel and a 3-yard dipper. The majority of stripping and mining contractors in the Mesabi region use a shovel of from 60 to 80 tons weight. In stock-pile loading a slightly lighter machine can be successfully used.



THE STEAM-SHOVEL AS USED ON THE MESABI RANGE.

In the early days most of the engines and dump-cars used on the range were narrow gauge; dinkey engines and small cars. But this has all been changed and standard-gauge tracks are laid in almost every operation, while the dump-cars are quite elaborate affairs, costly, but efficient. In such operations as those on the Mesabi, there is no argument for gauges less than standard, and it is doubtful if there are many places where a steam-shovel can be economically used in which a narrow-gauge equipment is the proper thing. It takes not only power but weight to haul loads out of a pit in which the grades may reach 2.5 or 3%, and the dinkey engine is not successful.

The steam-shovel has done big work on the Mesabi range. In single years it has moved as much as 6,000,000 cu. yd. of waste material and mined 12,000,000 tons of ore. To this time the proportion of product excavated by shovel has varied up to about 56%, increasing as the years have passed; for 1906 the proportion will be greater, and it is assured that the percentage of shovel-mined ore will continue to increase. Although half of the ore output on this range two years ago was mined underground, and more than half produced since the beginning has been hoisted through shafts, it is safe to say that, were the Mesabi range to be opened new today, in the light of the experience acquired in the past few years, there would be scarcely a 'caved mine' from one end to the other; what few shafts might be sunk would be to connect with milling pits that had been opened from surface by shovel, and mined, in many cases, by shovel-loading at the bottom of some deep pit into tram-cars for the shaft. The tendency, in other words, is toward the exclusive use of open pits of one form or another. This is due to several causes; the increased efficiency of shovels, reducing costs of handling dirt; the higher value and greater scarcity of suitable mine-timber; the inefficiency and unreliability of common labor and its continual liability to go back on the operator at times when he is in especial need of a big product. The shovel never goes on strike, though it sometimes breaks down, its employees are few and of a class quite different from the ordinary laborer.

In mining ore the larger steam-shovel mines of the range have achieved products of from 30 to 100 tons per day per man, the variation being great on account of the diversity of conditions. Last season one shovel at the Hull mine in 335 minutes loaded 4,140 gross tons from the stock pile. A 25-ton car is usually loaded in three or four minutes. Three shovels at the Burt open-pit in ten hours loaded 18,000 tons from the natural bed. The Mahoning mines handle about 1,000,000 tons per annum with three shovels in ore, and these three working but part of the time; it could easily produce as much more, if required. The Biwabik mined last year 1,100,000 tons with three crews operating five shovels. Not more than three shovels could be worked at one time, and the larger number was in place simply to permit the mixing of ore in the pit to reduce ores to the guaranteed grades. These tonnages are handled in about seven months. In one ten-hour day at this mine three shovels loaded five hundred 30-ton railway cars, 15,000 gross tons. At the Stevenson one 105-ton shovel loaded 7,109 tons in ten hours, at the Burt one 93-ton shovel loaded 5,096 tons, while at the Mountain a machine of the same size and make loaded 4,826 tons in that time. To be sure, most of these are far above average runs; they are record operations and have little bearing on what is the ordinary duty. In almost every case the ore ahead of the dipper is loosened by charges of black powder blasted in holes that have been drilled and then 'sprung' by a few sticks of dynamite; but this preliminary is not infrequently omitted, and the ore is often taken from the natural bed as it has lain since originally formed. Contracts for mining ore have been taken at 10c. per ton, and there is understood to be good profit at that price.

In stripping overburden the steam-shovel contractors have been working successfully under agreements running from 30 to 40c. per yard and averaging, say, about 32c. There is, of course, a profit at this price. Cost sheets sometimes show as low as 18.5 to 19c. per yard. Operations are largely dependent on weather conditions, the supply of labor and the excellence of superintendence, which varies greatly. The length of run to waste-banks, the grade out of pit and on to bank, the character of stripping, whether it contains much boulders, hardpan, etc., or is chiefly soil and clay, are all important items; and even the time of year in which the work is carried on has a noteworthy influence. It was formerly thought that winter stripping was the more costly, but that opinion is giving way and must become obsolete in time. From 28 to 30 yd. of spoil per day per man is a fair average. For 20 hours' continuous work one shovel and its attendant trains will move from 1,500 to 2,000 yd. of material, and a shovel and attendant trains will use, say, 75 men on two shifts. Larger mining companies now do much of their own work.

Companies operating shovels are installing well-equipped machine shops for repairs, so these may be attended to close by and in the least time. It is rather important that breakages may be fixed on the spot, rather than wait the leisure of some distant erecting shop full of its own work, or pay the cost of long carriage by express.

The question of how much surface may be taken off the orebody with economy is an ever present one on the Mesabi. In the copper mines of Bingham, at the Cactus, Ely, and other points where it is proposed to utilize this machine, there need be no such question, for the overburden is so slight as to be unworthy of a moment's consideration. Over the Bingham monzonite ores it runs but a few feet, and is even less, I understand, at Ely. At Granby, too, the surface is very slight, though more than at Bingham.

Only one determined effort has been made to oust the steam-shovel from its lead as a remover of overburden and miner of ore. This is by the well-known firm of Hoover & Mason, of Chicago, who are erecting, at the

Grant mine of the Interstate Iron Co., a great overhead clamshell contrivance. It is hung on a cable stretched between a pair of movable towers each 150 ft. high and placed 1,100 ft. apart. The clam weighs 25 tons, and is supposed to take up a load of the same weight. It has not come into service, but will be tested in a few weeks, and should be in operation during the summer. No criticism of the machine is advisable, though the general opinion is somewhat adverse, as yet. But the fact remains, that if a shovel had been put at work on the Grant overburden when the construction of this machine began, the Grant might have been a large shipper this year, while now it can scarcely put out any considerable tonnage before 1907. And the first cost of the shovel outfit would have been but a fraction of the investment this machine represents.

I have said only one determined effort; there remains the scheme for an electrical shovel taken up a year ago in a rather vigorous manner, but for some reason it has been permitted of late to drop into a state of innocuous desuetude, to be taken up vigorously, perhaps, later, when those interested have more time on their hands. Some engineers have recommended a shovel operated by compressed air, but this seems absurd, in the light of conditions prevailing at open pits. Electrical operation of shovels, where water-power is available, ought to reduce costs materially.

Quartz Blout.

In a valuable geological report on the Ely district, Nevada, entitled 'The Copper Deposits of the Robinson Mining District, Nevada,' by Mr. Andrew C. Lawson, professor of geology in the University of California, the author introduces a new term, which he defines in the following paragraphs:

Perhaps the most remarkable feature of the porphyry is the occurrence, in the areas occupied by the latter, or on their periphery, of large bodies of quartz of somewhat varying character. These bodies of quartz are by no means uncommon features of decomposed and mineralized eruptive rocks in Nevada and elsewhere; and the prospectors and miners, who have to deal with them practically, usually distinguish them from ordinary vein quartz by characterizing them as 'blow outs.' This discrimination appears to the writer to be well warranted. They cannot be regarded as veins or lodes; and while, as will be shown later, they are to a large extent replacements of other rocks, they may not be wholly so. They constitute a particular mode of occurrence of quartz which the writer desires to distinguish both from vein quartz and from replacements of country rock by silica in the vicinity of veins. To signalize the distinction and to simplify their discussion, the miners' term 'blow out' will be adopted in the modified form of 'blout,' and they will, therefore, be referred to henceforth as 'quartz blout,' much in the same sense as one would use the expression 'quartz vein.' Similarly as we designate the quartz of a vein specifically as 'vein quartz,' so here we may refer to the quartz of which the blouts are composed as 'blout quartz.'

The most striking feature of these quartz blouts is their vast size as compared with ordinary veins. A glance at the map will show that in the vicinity of the Ruth mine they occupy a very considerable fraction of the area of the porphyry; perhaps one-third is occupied by the blout.

The mapping indicates that the greater part of the quartz blout lies on the periphery of the porphyry mass and occupies an intermediate position between it and the surrounding limestone; and although some important occurrences are more centrally situated, these from the mapping appear to be of the nature of caps upon the hill tops and ridges. If we accept the suggestion thrown out in an earlier portion of this paper, that the porphyry mass is of the nature of a laccolith, then these centrally situated quartz blouts are also peripheral, and represent a contact development between the porphyry and its roof of limestone now removed by erosion. Indeed, we can form a very consistent hypothesis to explain the distribution of the blouts by supposing that they were once a more or less continuous envelope, incasing the porphyry, particularly on its upper side, and intervening between it and the over-arched roof of limestone. The removal of the limestone roof by erosion and the dissection of the envelope of quartz blout, leaving exceptionally thick or resistant portions of it as residuals reposing upon the porphyry, would well explain these occurrences.

Waldemar Lindgren of the United States Geological Survey will spend about two weeks the coming summer, in picking up the scattered threads of an investigation which he began last year of the mining districts of New Mexico, but which was interrupted by early snows.

The Effect of Temperature on Amalgamation.

By Thomas T. Read.

In a paper to be read before the American Institute of Mining Engineers, entitled 'The Amalgamation of Gold Ores,' Mr. Thomas T. Read, of Columbia University, gives the results of his investigation of direct changes in amalgamation due to temperature. The following is an abstract verbatim:

Whether variations of the temperature at which the process is conducted have any direct specific effect on amalgamation, has been the subject of much discussion. It will be impossible to refer here to all the statements made regarding this, but a few of the more significant must be mentioned. J. A. Grier[1] states that when two batteries were run side by side on the same ore, the one at 50°F. and the other at from 60° to 70° F., considerably more gold was caught by the battery at the lower temperature. J. A. Church[2] cites a case where water from old mine-workings was used that had a temperature of 135° F., at the battery; the plates coated badly and the recovery was very poor. T. A. Rickard[3] says that at Black Hawk, Colo., the recovery is better in winter than in summer, and objects to the practice at the Brittania United, Ballarat, of warming the battery-water. Louis Janin[4] says that no advantage is gained by heating the battery-water. At the Golden Star mill, Supt. Reed[5] changed a battery from 56° to 70° F. In 24 hr. the amalgam had nearly all scoured off. This was a silver plate; the copper was not affected. It is not stated whether all other conditions were kept constant, and it is hardly safe to comment on such an experiment unless all the conditions are known. J. A. Sanborn[6] says that the objection to an increase in temperature is that the plates were prepared for a lower temperature, but that the adjustment may be made for any reasonable temperature. He also says that the chief objection to hot battery-water is the resultant increased solubility of deleterious salts. J. H. Thierman[7] suggests that the heated water causes any grease which may be present to more readily form a film over the gold and mercury. A. von Dessauer[8] found that the plate-amalgam contained from 20 to 35% of gold in the summer time, but only from 7 to 10% in winter. Besides these factors, R. H. Richards[9] mentions two others, the attraction of mercury for gold and the cohesive power of the mercury. It should be noticed, however, that the only attraction mercury has for gold is the surface-tension pull; and that the facilitation of the coalescence of globules of mercury by a rise of temperature is not due to an increase of cohesive power, but to a decrease of their surface tension.

To determine whether other physical constants are appreciably affected by temperature changes, two lines of investigation were followed. The purpose of the first was to learn whether the plasticity of the mixture of liquid and solid, ordinarily known as 'amalgam,' varied to any degree with ordinary ranges of temperature.

For this purpose an apparatus was designed and constructed, in which a pasty mass of amalgam was held in a cup that was rotated by a small electric motor. The cup was provided with sharp points on the inside, so that the amalgam was obliged to rotate with it. Submerged in the mass of amalgam was a stirrer, turning in a ball bearing. The torsional pull on the stirrer, when the mass was rotated, was measured by a delicate helical spring. The whole apparatus was placed in a constant temperature chamber, and numerous observations made over the range from 18 to 100° C. (60 to 212° F.). Both silver and gold amalgams of the consistency of thick cream were used; it was necessary to employ very finely divided metal in preparing the amalgam in order to make it homogeneous. It was found that, as a result of the increase of temperature, two conflicting changes tended to take place: The amalgam tended to become harder from the increased absorption of the mercury by the gold, and softer from the decreased viscosity of the liquid mercury cementing the solid particles. The total change was very slight, and of the same order as the errors of observation due to the settling of the solid particles and the slight imperfections of the apparatus. A more detailed statement of the results, and a sketch of the apparatus, are therefore omitted. The investigation showed that the changes in plasticity induced by ordinary variations in temperature are negligible.

1 Engineering and Mining Journal, lxv., p. 126.
2 Engineering and Mining Journal, lxv., p. 158.
3 Stamp Milling of Gold Ores, pp. 125-6.
4 Mineral Industry, iii., pp. 328 and 343.
5 Engineering and Mining Journal, lxv., p. 126.
6 Engineering and Mining Journal, lxv., p. 397.
7 Engineering and Mining Journal, lxv., p. 247.
8 Engineering and Mining Journal, lxv., p. 760.
9 Ore Dressing, p. 766.

The purpose of the second investigation was to learn whether the adhesion of gold to mercury is sensibly affected by changes of temperature. To this end the inclination at which spheres of gold, silver and platinum, one-half an inch in diameter, will roll down an amalgamated copper-plate were observed. Two sets of angles were measured; that at which the spheres would start to roll from a state of rest (column A), and the angle at which they would continue to roll after being started by a touch from a camel's hair brush (column B). The inclination was measured for the dry plate at ordinary temperature (20° C.), the amalgamated plate at the same temperature, and the amalgamated plate at 100° C. The gold and platinum spheres were perfect to within 0.001 in.; the silver sphere was not so perfect, and gave more irregular results. The angles recorded are the average of several observations. The plate was somewhat roughened by the action of the mercury at the higher temperature; this is especially noticeable in the angles at which the balls would start themselves. The gold and silver balls were previously amalgamated for the determinations with the amalgamated plate, but the platinum ball, of course, was not.

Results of Adhesion Tests of Gold, Silver and Platinum Balls.

	Platinum.		Gold.		Silver.	
	A.	B.	A.	B.	A.	B.
Dry plates, 20°....	1° 28′	0° 28′	1° 09′	0° 32′	2° 17′	0° 48′
Wet plates, 20°....	1° 45′	0° 28′	1° 48′	1° 15′	3° 07′	1° 57′
Wet plates, 100°...	1° 43′	0° 54′	2° 03′	1° 30′	.....	1° 30′

These facts are so completely in accord with the data obtained by the metallurgical and chemical investigations, that there seems no escape from the conclusion that amalgamation of gold ores is mainly, and above all, a simple mechanical process. Such chemical forces as enter into it are only slight, and are mainly detrimental. The chief physical factor is the surface-tension of the mercury, which causes the mercury to cling in an adherent film to the plates employed, to wet the gold grains, and to draw them beneath its surface. It also acts detrimentally, tending to prevent the globules of mercury from coalescing again when they are very finely divided. The solution of the gold and silver by the mercury is very slight indeed; that of the copper is more noteworthy, and gives opportunity for undesirable chemical action. The absorption of the mercury by gold, silver and copper is large in amount. With gold, what is probably an inter-metallic compound is formed with excess of mercury at 100° (whether it can form at ordinary temperatures is not certainly known), but this is of no great importance in the ordinary application of the process. Some sort of molecular flow causes the grains of the amalgam to adhere strongly together on standing, and the slow diffusion of the gold into the plate causes the amalgam to adhere strongly to copper and silvered plates. According to Richards[10] this diffusion does not extend to any great depth in the ordinary life of a plate.

The effect of changes in temperature on amalgamation is seen to be two-fold. The solubility of deleterious salts in the ore is, of course, increased by rise of temperature, their action is accelerated, and the solubility of copper in the mercury is increased, thus giving greater opportunity for these harmful reactions. But the most important effect is the disturbance of plate-equilibrium, resulting from changes of temperature. The thickness of the film of mercury which the plate will hold, and the absorption of mercury by the other metals concerned is changed, and the mill-man then has to deal with varying conditions, a state of affairs to be avoided, if possible. From the physical standpoint the temperature employed does not matter, so long as it is constant. From the chemical standpoint a low temperature is better in most cases. But it should be mentioned, in passing, that both the viscosity and surface-tension of mercury are lessened by rise of temperature, the differences for ordinary ranges of temperature being slight. Under certain circumstances, where chemical action is negligible, it seems that it might be advisable to conduct the process at elevated temperatures, for the wetting of the grains by the mercury is slightly facilitated by rise of temperature. The viscosity of mercury at 0° is 0.0169 dynes per sq. cm., and at 99° is 0.0123 dynes per sq. centimeter.[11]

In the operation of the stamp-milling process the character and gold content of the ore necessarily vary. If, in addition, the temperature, and with it all the foregoing factors, are allowed to vary, it becomes impossible to exert a proper control over the operation.

10 Ore Dressing, p. 765.
11 Koch, Poggendorf's Annalen, vol. xiv., p. 1 (1881).

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock specimen from Unionville, Nev., marked R. L. P., is calcareous sandstone.

The rock from Eureka, Nev., marked T. P., is silicious metamorphic rock—possibly silicified limestone. Rocks of this character are of frequent occurrence in limestone regions that have been subjected to the intrusion of dikes and the infiltration of mineral-bearing water.

The rocks from Kingman, Ariz., are: No. 1, Granite, in which both biotite and hornblende are present; No. 2, a basic hypersthene rock, probably Basalt; No. 3, partially devitrified volcanic glass; No. 4, Basalt; No. 5, Rhyolite; No. 6, Rhyolite; No. 7, Quartz-porphyry; No. 8, Rhyolite; No. 9, Rhyolite, with numerous amygdules containing chalcedonic quartz; No. 10, Rhyolite tuff; No. 11, Rhyolite; No. 12, a silicious rock, apparently the result of alteration of some other rock (probably Rhyolite); No. 13, opalescent silica, also the result of alteration.

The rocks from Table Rock, Cal., marked T. G., are: No. 1, Quartz with limonite; No. 2, Quartz and feldspar with iron oxide, evidently from a pegmatite vein; No. 3, a much altered and iron-stained dike rock, probably Diorite; No. 4, Serpentine; No. 5, silicified and decayed dike rock, also originally Diorite; No. 6, a much kaolinized eruptive rock, in which only the hornblende remains slightly unaltered; No. 7 is Feldspar-porphyry and affords a hint as to the original character of No. 6, which was probably similar to No. 7; No. 8 is a metamorphic rock containing much iron oxide. None of the rocks of this lot are typical, and nearly all are so much altered as to make their identification somewhat doubtful, the only exceptions being No. 4 and 7.

A New Map representing parts of California and Mexico has recently been published by the United States Geological Survey which is of unusual interest at this time. The area covered is widely known as the Salton Sink, a great depression in the Colorado desert which has been much discussed lately, owing to the threatened formation of a large inland sea where there is now a thriving community. About 8,000 people have settled in that part of the basin known as the Imperial valley and are raising excellent crops of barley and alfalfa. Stock farms are numerous and experiments in raising the date palm are in progress. The freight shipments from Imperial, a town only four years old, rival those of Los Angeles in value, and are said to exceed those of any other town in southern California. The existence of this peaceful community is however seriously endangered by Colorado river which strangely enough is also the source of all its prosperity as it is this stream which furnishes water for the irrigation system. The absence of any controlling works at the head of the main canal has resulted in diverting the river from its old channel and permitting the entire flood flow to enter the irrigation system. This is causing great damage to the ditches and crops, and is forming a large lake, which now covers about 250 square miles, at the lowest part of the sink. The Southern Pacific railroad has been obliged to rebuild many miles of tracks. The map of this region, which is called the Salton Sink special, shows on a scale of about eight miles to an inch, all the principal towns, roads, canals and drainage lines. Contour lines also indicate what the future sea may cover at different altitudes. The usual price of five cents a copy will be charged for this map, which was made by Mr. W. Carvel Hall, under the direction of Mr. R. B. Marshall.—From 'Science.'

Transporting a Boiler.

The accompanying illustration shows a boiler being taken across New Mexico by a novel method. It is a 125-h.p. Scotch stationary boiler, built by the Kingsford Foundry & Machine Works, for the Marine Hospital at Fort Stanton, New Mexico. It was necessary to transport the boiler for a distance of nine miles across the plains and mountains, and as the roads were in a condition rendering impossible the passage of a wagon with such a heavy load, it was found necessary to rig up the boiler as shown. A heavy pipe was used as an axle, and mules furnished the motive power. The picture shows the boiler on level ground just before entering the station.

The Volumetric Estimation of Antimony.

Written for the MINING AND SCIENTIFIC PRESS by JAMES DARROCH.

All of the gravimetric methods of estimating antimony are tedious and many of them are unreliable, while the dry assay, although fairly expeditious, is notoriously inaccurate. When sodium thiosulphate (hypo) solution is used in the titration, the iodide method cannot be relied upon, as the hypo is decomposed, with the separation of sulphur, by the strongly acid solutions which must be employed.

The method described below gives excellent results with all ores and alloys containing antimony, and it is much more accurate than any of the gravimetric methods so often employed in estimating that metal, while it possesses the further advantage of being almost, if not quite, as speedy as the dry assay. This process is similar to the iodide method mentioned above, the principal exception being that a standard solution of stannous chloride is substituted for the thiosulphate solution generally employed in the titration.

The determination of antimony by the iodide method consists of estimating the amount of iodine liberated when potassium iodide is added to a solution of antimonic chloride. It is essential for the success of this process that all of the antimony should be converted to antimonic chloride ($SbCl_5$), while free chlorine must be completely absent from the solution, which should be kept strongly acid.

The assay is conducted as follows: From 0.5 to 1 gram of the finely crushed ore, which should pass a 100-mesh screen, is dissolved in strong hydrochloric acid, with the addition of a few crystals of tartaric acid, heat being applied until no further action takes place. When the antimony is completely in solution, the assay is diluted to about 300 c. c. and a brisk current of sulphureted hydrogen is passed through the liquor until it is thoroughly saturated. After the antimony has all been precipitated, the sulphide and insoluble residue is filtered off and washed two or three times with water containing sulphureted hydrogen. The filtrate, which contains the iron, etc., present in the ore, may be discarded.

The filtering and washing should be done as quickly as possible, as the antimony sulphide is liable to decompose and again go into solution on exposure to the air.

The bottom is now knocked out of the filter, and the precipitate washed into a flask. About 100 c.c. of strong hydrochloric acid with the addition of a sufficient quantity of potassium chlorate to completely convert the antimonious chloride to antimonic chloride, are now added to the assay, and the solution is then boiled until the sulphide has dissolved. After free chlorine has been entirely eliminated the assay is allowed to cool, and, when cold, about 5 grams of potassium iodide is added to it. Iodine is liberated by the antimonic chloride in accordance with the reaction:

$$SbCl_5+2KI=SbCl_3+2KCl+I_2$$

The assay will assume a brown color, due to the iodine liberated, but should contain no precipitate as antimonious chloride ($SbCl_3$) is soluble in strongly acid solutions.

The solution should immediately be titrated with a standard solution of stannous chloride, and, during titration the assay should be thoroughly shaken. The color is gradually discharged as the stannous chloride is run in, and when it has become pale, a few cubic centimeters of freshly prepared starch solution are added, and the assay well shaken. A deep blue color is at once produced, and the titration is continued until this is discharged. The end reaction is very sharp, even sharper than in the iodic method of determining copper, and, consequently, the titration should be done cautiously as this stage is approached. When the reaction is complete the assay should be quite clear except for the insoluble residue. The blue color generally reappears on standing a minute, but this is due to secondary decomposition, and may be disregarded. It is discharged by the addition of a single drop of the stannous chloride solution.

The stannous chloride reacts with free iodine in the presence of hydrochloric acid thus:

$$SnCl_2+I_2+2HCl=SnCl_4+2HI$$

The volume of the standard solution of stannous chloride required for titration × standard of same = the weight of antimony in the sample taken for assay.

Therefore the percentage of antimony present is found by the following calculation:

$$\frac{\text{Standard x number of c. c. stannous chloride solution required}}{\text{Weight of ore taken for assay.}} \times 100 =$$

per cent of antimony in the ore.

Since copper and arsenic also liberate iodine, and as bismuth iodide resembles free iodine in color and would therefore interfere colorimetrically in the titration, these metals, if present, must be removed from the solution. The copper and bismuth may be separated by washing the combined sulphides on the filter with a solution of sodium sulphide; the arsenic by boiling the sulphides of arsenic and antimony with strong hydrochloric acid. Tin does not interfere, as it would be present in the stannic condition only.

TRANSPORTING A BOILER UNDER DIFFICULTIES.

The solutions required for the assay are:

Standard solution of stannous chloride. This is prepared by dissolving 10 grams of stannous chloride in hydrochloric acid, and diluting to a liter. This solution should be kept under paraffin as it oxidizes very rapidly.

Standard solution of antimonic chloride for standardizing. This solution is used to standardize the stannous chloride solution, and it is prepared by dissolving 0.2 gram pure antimony in strong hydrochloric acid and potassium chlorate. This must be done in the cold, as antimony is almost quite insoluble in hot hydrochloric acid and potassium chlorate. When the antimony has dissolved, the solution is boiled until free chlorine has been eliminated, allowed to cool, potassium iodide added, and titrated with stannous chloride in the same way as described for the assay. The antimony equivalent of the stannous chloride solution is found by the calculation:

$$\frac{\text{0.2 gram antimony.}}{\text{Number of c. c. stannous chloride solution required for titration}} =$$

the amount of antimony (in grams) represented by each c.c. of the standard stannous chloride solution.

Starch solution. This is prepared as for the iodide method for copper. It must be fresh and free from floating particles.

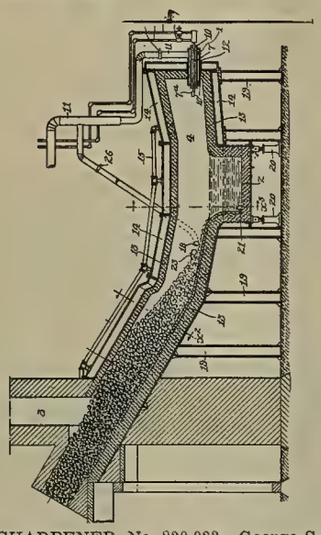
An instrument of precision is not an absolute necessity in keeping a shaft in alignment. Frequently inclined shafts are allowed, through carelessness, to get badly out of line. All that is required is to keep the hoisting rope midway between the track-rails or skids, and the shaft will be true enough for all practical purposes.

Mining and Metallurgical Patents.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

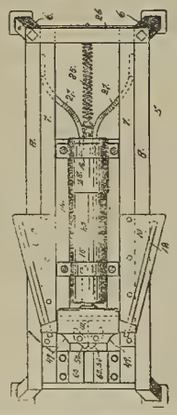
PROCESS OF SMELTING ORES, No. 820,134. Elfego Riveroll, Los Angeles, Cal.

The process for treating ore which consists in feeding and supporting the ore on an inclined surface, allowing the ore to move downward on said surface by gravity, arresting the downward movement of the ore at a definite position, applying a blast of hot gases against the lower end of the body of ore, confining said hot gases to cause them to pass upwardly through the body of ore, withdrawing the hot gases from the body of ore before they reach the point at which the ore is fed to the inclined surface, and applying a supplementary blast of air to the body of ore between the point of application of the hot gases and the point of withdrawal of the hot gases and allowing the fused ore at the lower end of the body of ore to drain from the unfused ore, and maintaining the fused ore in heated condition to enable the metallic portion thereof to separate from the slag.



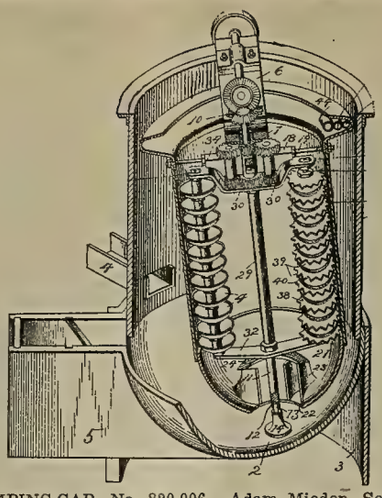
DRILL-SHARPENER, No. 820,023. George S. Spreyer, Elkton, Colo.

The combination with a suitable frame, of a spring-held casing, a slidable support therefor movable back and forth on the frame, yielding means connected to act on the support whereby the casing is normally held at its forward limit of movement, a hammer mounted to reciprocate in the casing, means for imparting a reciprocating movement to the hammer through the instrumentality of a suitable operating fluid, a chuck connected with the casing and arranged to be acted on by the hammer, the chuck having a limited movement in the casing, sharpening-dies laterally movable in the chuck, and means connected with the dies for causing the latter to recede from each other as the chuck and casing are moved rearwardly in opposition to the yielding means acting thereon, and arranged to be rendered effective by the rearward movement.



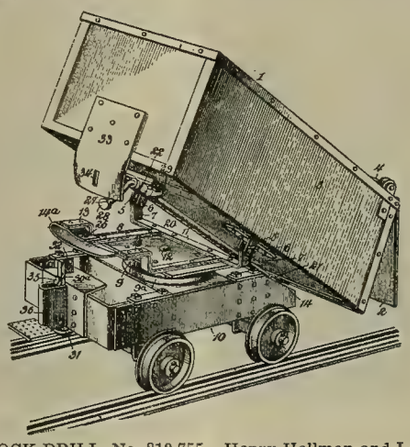
ORE-SEPARATOR, No. 820,568. Hiram C. Groves, Woodward, Okla.

In an ore-separator the combination with a casing having an inlet; of an inclined bowl rotatably mounted within the casing and having an inlet in the bottom thereof, curved means for whirling liquid upward through the opening and against the wall of the bowl, agitating devices at one side of and staggered in relation to the axis of the bowl and movably mounted within the bowl and means for operating said bowl and the agitating devices.



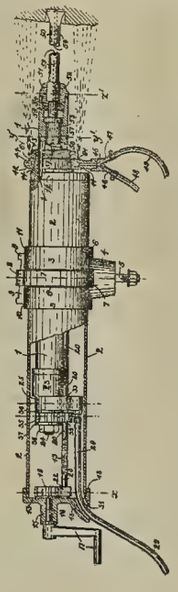
DUMPING-CAR, No. 820,006. Adam Mieden, Seattle, Wash.

In a device of the class described, the combination of a truck-frame having a turn-table or support provided with a horizontal supporting-plate, a transverse bar mounted on the plate at the front of the same and having upwardly-extending arms, a tilting body having a door and pivoted to the said arms, rearwardly extending arms projecting from the back of the plate, locking mechanism mounted on the body for holding the door in its closed position, and means carried by the rearwardly-extending arms for operating the locking mechanism.



ROCK DRILL, No. 819,755. Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal.

In a rock-drilling machine or engine, in combination, a casing, a power-cylinder therein, a cap fixed at the rear end of the power-cylinder, formed with a rearward extension, a swivel arranged on said extension and adapted to admit the motive fluid through said extension to the power-cylinder, a pipe for conducting the motive fluid to said swivel, packings arranged at either side of said swivel to prevent the escape of the motive fluid from between the swivel and the extension upon which it is arranged, and screw connections leading from the outside of the cap and passing through the swivel, for moving the power-cylinder.

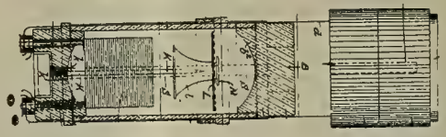


CORE-DRILL, No. 821,130. J. M. Smith, Reynoldsville, and R. M. Downie and F. W. Ransom, Beaver Falls, Pa.

The combination with a tubular reciprocatory drill-stem having a percussion-cutter at its lower end, of a tubular core-holder located within the stem and having a free longitudinal movement in the same, the lower portion of said tubular core-holder being movable freely through the percussion-cutter, and a spring engaging the holder and urging the same through said percussion-cutter.

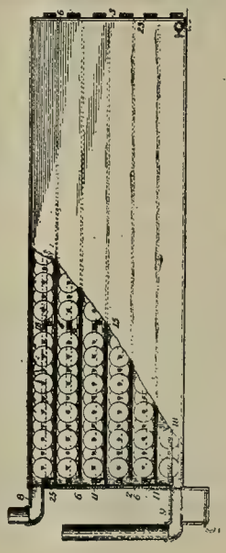
MEANS FOR SURVEYING BORE-HOLES, No. 821,048. H. F. Marriott, Parktown, Transvaal.

In an instrument for surveying bore-holes the combination of a magnetic compass constructed with a bell-shaped base, a vertical needle on the extremity of which said compass-base is supported, a mirror carried by the compass, a resistance-coil below the compass, a substance surrounding said coil which substance is liquefiable by the passage of a current of electricity through the coil, said substance serving on resolidification to retain the compass in the position it assumes when the substance is liquefied at the point to be surveyed, wires or conductors for passing a current of electricity through the coil, and a casing for inclosing the several parts of the instrument constructed with a longitudinal feather or projection and fitted with a diaphragm for supporting the instrument in the casing.



AMALGAMATOR, No. 821,108. A. G. Macdonell, Chevy Chase, Md.

An amalgamator comprising a substantially closed tank, partitions therein arranged to afford a tortuous passage through the tank, removable plates having amalgamated surfaces which completely inclose said passage, vertical disks arranged in said passage parallel with the direction of flow of the liquid passing therethrough, and means for imparting motion to said disks.



Special Correspondence.

LONDON, June 6.

That substantial progress is being made in the Colony of British North Borneo is proved by the particulars given at the general meeting of the British Borneo Exploration Co. Ltd. held this week. In the course of his address the chairman, Mr. Edmund Davis, said the company was formed in February of last year with a capital of £500,000, divided into 400,000 ordinary shares, and 100,000 founders' shares of £1 each. The total subscribed working capital was £100,000, £20,000 having been so far called up, leaving £80,000 still uncalled. The concession acquired by the Company gave exclusive rights for a period of 50 years to explore for minerals, etc., in British North Borneo, some 31,000 square miles. At the outset of the Company's operations they were in the fortunate position of becoming the owners of large deposits of manganese ore, a mineral of which the world's annual production was as near as possible 1,000,000 tons. They had shipped sufficient material to construct eight miles of railway with 35 lb. rails, and five miles with 16 lb. rails. Some 30,000 tons of manganese had been sold for future delivery, the buyers having the option under certain conditions of taking a further 38,000 to 40,000 tons as soon as available. In addition to manganese, large deposits of iron had been discovered, and deposits of coal were reported quite close to the manganese. Oil was being worked in Dutch Borneo on a large scale, as much as 9,000 tons per week of crude oil being produced at the present time. An option had been given to certain responsible parties to form a syndicate for the exploitation of the oil rights. Referring to the manganese ore deposits the chairman informed the meeting that they were constructing a metre-gauge railway of between five and six miles in length, with 35 lb. rails and with branches of 18-in. gauge, with 16 lb. rails, to connect some of these deposits with the coast, where a jetty had been constructed to afford shipping facilities. The deposits are principally situated in the hills, reaching up to about 1,000 ft. in height, and chutes are in course of construction for the purpose of bringing down the mineral to the railway. The seams of ore vary from 1 to 6 ft. thick, and though generally covered by a layer of clay or chert, are easily mined, being principally near the surface. The Borneo manganese ore has an exceptionally low percentage of phosphorus and sulphur. The same can be said of the iron ore, the various samples of which show an average of 63½ per cent metallic iron, and there are about 1,500,000 tons already exposed. As regards coal it is reported that large quantities are available 15 miles from the manganese mines.

Although little interest is taken by the public in West African matters, the 'Daily Mail' wishes to make known that the industry itself is making steady progress. To the ranks of the half-dozen producing properties will be added three more in the not distant future. The Prestea Block A should have its 50-stamp mill in full working order by the end of July, with a two years' supply of ore ready for crushing. The Attasi finished its 15 miles of tram-line from the mine to Dunkwa, on the Gold Coast Railway, in December last, and has since been erecting a mill of 50 stamps with cyanide plant capable of treating 6,000 tons per month. The end of July should also see this property at work with 20 months' supply of ore. The Taquah is also engaged in putting up a new plant, and its 50 stamps should be dropping early next year, when it is expected some 170,000 tons of ore will be ready for treatment. Working costs in West Africa are undeniably heavy. As more properties reach the producing stage, an appreciable reduction in store expenses should be made, but there is still great dissatisfaction at the abnormally high rates on the Gold Coast Railway.

The 'Australian Mining Standard' furnishes the particulars of the Australasian gold production for the first quarter of the current year. Here is the comparative statement in detail:

Returns for March Quarter.	1905: Fine oz.	1906: Fine oz.
West Australia	480,401	452,366
Victoria	161,057	177,494
Queensland	133,922	115,248
New Zealand	117,754	123,325
N. S. Wales	69,906	77,337
Total	963,040	945,770

It is seen that the West is behind by 28,035 oz., while increases are shown by three out of the five contributing States.

The crowded meeting of Oroya Brownhill shareholders last week, presided over by Mr. George P. Doolette, reflected the brilliant position of the Company. Referring to the accounts the chairman pointed out that the output of gold for the year was £653,485.18.9, the cost of winning it being £141,848.3.7. The amount distributed for the year and as a bonus on the previous year's working was £438,750, which represented nearly the whole of the nominal capital of the Company. The payment of the bonus in the year 1905 was made so as to bring the dividends for the previous year up to the uniform rate of 16s. per share, which he hoped they would maintain for years to come. The reduction in costs had been a feature of the year's work; when the managers, Bewick, Moreing & Co., took charge of the mine at the time of the amalgamation, the costs were 43s. 3d. per ton; today they were down to 22s. 4d., with the possibility of a still further reduction. This reduction, compared with the average for 1905, will mean an additional profit of £15,000 to £20,000 per annum to the Company. The chairman had good reason for saying that the year in many respects had been a record one. He thought the treatment of 112,713 tons of ore, of the average value of 27 dwt., would take some beating. While, of course, other mines are treating a much larger tonnage, he questioned if any mines in the world can beat their record as to value. It was the intention of the management to bring down the average value of the ore treated without in any way interfering with the rate of dividends now being paid, namely 16s. per annum, or at the rate of 30 per cent on the capital value of the stock. Having this year written off the whole of the developments and main shaft account, together with £28,000 from machinery and plant, and in view of the reduced provision which will in future be required for depreciation, they could reduce the average value of the ore treated and yet maintain the present rate of distribution for a much longer time. Dealing with the developments, the chairman remarked that in the upper levels of the Brownhill lease, as also in many other places in the mine, they had been opening up large quantities of low-grade ore; ore which, a short time ago, was not considered payable, but which under present conditions can be treated at a profit. The Brownhill leases had been a veritable widow's cruse to the Company. At the time of the amalgamation this property was considered to be little more than a shell, containing something like 55,000 tons of ore, whereas up to the present time the mine had contributed 150,000 tons of ore, being nearly one-half of the total tonnage treated, and the Brownhill leases would continue to supply ore to the mill for some time to come. The most important discovery in the mine during 1905 was the branch from the rich shoot which was discovered at the fifth level, 50 ft. east of the main north drift, where ore, 5 ft. 3 in. wide, was driven on for a distance of 23 ft. and worth 5 oz. 17 dwt., and an incline raise put up from the drift for 70 ft., averaged 3 oz. 14 dwt. per ton. The managers stated they could not yet estimate what quantity of rich ore this will yield, but these unexpected finds upset any calculations as to ore reserves.

The South Australian Minister for Mines has received the following report from Mr. H. L. Y. Brown (the Government Geologist) respecting the discovery in South Australia of the very rare and extremely valuable mineral, carnotite: "I have just received from Mr. A. Smith some specimens of a mineral which has been analyzed by Mr. Chapman at the School of Mines, and determined by him as carnotite. It comes from a lode located on a lease held by Mr. Smith in the Olary district. The importance of this discovery centres in the fact that pitchblende oxide of uranium is the mineral from which the rare substance of radium is obtained. The owner of the lease has arranged to provide bulk samples of the ore for examination and analysis. I propose to visit the locality at an early date."

A sign of the times is to be found in the proceedings at the general meeting, this week, of the West Australian Goldfields Ltd. In recommending a forward policy for the Company, the chairman called on his colleague, Mr. Oliver Wethered, to give an account of a tin property in Cornwall which had been offered them. Mr. Wethered, after the inevitable reference to Dolcoath, remarked that the awakened interest being taken in Cornish mining was no doubt due to the big rise in tin, consequent on the great demand for that metal and the reduction in visible supplies by nearly two-thirds in the course of eight years. The authorities, although differing in their views as to whether the present high prices will be maintained, were at one in believing that a much higher average of price may be expected for a long time to come. Another factor was the introduction of electrical power, which will enable old shafts to be equipped with pumps of far greater capacity than was possible in the old days, but which pumps take a mere fraction of the space occupied by the old Cornish pumps. Then, too, the miners will be rapidly lowered and raised to and from their work by use of high-speed winding engines, instead of coming to the surface after exhausting climbing or by means of the old man-engine. The use of rock-drills, high explosives, and electrically-driven fans for ventilation, etc., will also greatly facilitate the reopening and successful working of the mines. The capitalization of any company should be on a conservative basis, and the royalties must be on a reasonable scale. It is due to the landlords to say that they are showing every disposition to arrange leases on that basis. With such conditions and the modern appliances, and the guidance of those widely experienced in Cornish mining, Mr. Wethered thought they might look forward to a good outcome of investments so near home, and where directors can give personal supervision by frequent visits to the properties. Some eight weeks ago, when in Cornwall, he was asked to visit a property which had been taken up by five working miners from South Africa, who had associated with themselves other miners, and between them they had put up 25 shares of £75 each, and opened up a good deal of ore and proved that they had a nice little mine, which, worked with adequate capital, could be made dividend-paying. This property they proposed to take in hand for the Company and it would not involve any large cash payment.

A favorable report for the year to December 31, 1905, is issued by the Briseis Tin Mines Ltd. (Tasmania). It states that, as was anticipated in the last annual report, the mine entered on the "producing stage" during the year, and the output steadily increased month by month until it reached 84 tons 1 cwt. from Briseis, and 30 tons 12 cwt. from New Brothers Home No. 1, or a total of 114 tons 13 cwt. in November. The December return was equally good, but on account of the Christmas holidays did not represent a full month's work. No difficulty has been found in keeping the overburden-faces sufficiently far ahead of the drift-faces, to prevent any possibility of a recurrence of the old conditions, and at the end of the year all the workings were in excellent order. The total output of black tin for the year from both properties was 971 tons, which produced 712 tons of metallic tin. Deducting 42 per cent of the No. 1 Company's tin (the proportion payable to them under the agreement), the total output of metallic tin belonging to the Company was 642 tons, which realized net £96,326.14.10. The average net price obtained during the year was thus £149 per ton. The net trading profit for the year, after paying all expenses, and writing £7,014.16.6 (10 per cent) off the cost of the water-races, amounted to £57,826.5.6. Since closing the accounts to December 31 last the Company has paid two dividends of 9d. each, on 600,000 shares of £1 each. The following particulars are taken from the report of Lake & Currie, the Company's engineers:

	Briseis.	No. 1	1905. Total.	1904. Total.
Overburden removed, cubic yards	455,500	96,048	551,548	755,424
Drift sluiced, cubic yards	281,950	199,400	481,350	173,440
Output black tin, tons	744.42	226.58	971	424.8
Output metallic tin, tons	546.4	165.9	712.3	311.26
Briseis Co.'s proportion of total output	—	—	642.62	311,26
Metallic tin sold	—	—	643.07	312.5
Average net price per ton	—	—	£149.6	£126.45
Total net proceeds	—	—	£96,326.7	£39,520.1
Rainfall at the mine, inches	—	—	49.78	48.96
Water available, average sluice-heads daily	—	—	148	166

The average cost of removing overburden during 1905 was reduced to 6d. per cu. yd. as compared with 6.21d. during 1904. A substantial reduction was also effected in the cost of winning tin. The average cost of producing black tin from the Briseis property, dressed and bagged at the mine sheds, was £9.45 per ton, equivalent to £12.11.3 per ton of metal, as compared with £11.19.5 and £16.7.4 respectively during 1904. To the above charges on metallic tin must be added £8.1.6 per ton for cartage, smelting, freight to London, and general expenses, making the total cost per ton of metal sold £20.12.9 per ton. Insurance and realization charges are not included in this item, as these amounts depend on the gross price obtained per ton. These figures include all expenditure except Melbourne, Hobart and London administration. As on former occasions, nothing has been charged on account of overburden removed, as it is impossible to allocate the proper proportion of overburden to each ton of metal won. The cost of this last year was estimated at from £8 to £12 per ton of metal produced, and this sum was not exceeded. An allowance of from £7½ to £8½ will be sufficient in the future, which will enable Briseis tin to be placed on the market at a total

cost not exceeding £30 per ton, including all charges except Melbourne, and London administration.

Stratton's Independence shares have slightly recovered from the shock administered by the cable noticed in my correspondence of last week. The manager reports by letter that the 200-ft. level in the Washington ground (granite area) is showing up well, and looks so promising that he is driving the 300-ft. level from the No. 1 shaft south to get under the orebody, also that the sampling of the dump now nearly completed will show an average value of a little better than three dollars per ton.

A somewhat belated cable from Dolores Mines Company announces the crushing for April month as 692 tons; total receipts $36,500; expenses $16,000; profit for the month $20,500.

Oroville Dredging Ltd. has declared a third dividend of 12½ cents per share payable on June 30. The annual meeting of the stockholders is to be held at Portland, Maine, on June 20.

TORONTO, June 15.

A large party of capitalists and mining brokers, under the direction of E. P. Earle of New York and his associates of the Nipissing Mining Co., visited Cobalt on June 9. Among the number were Wallace Nesbitt, H. F. Wyatt, F. T. Osler, Victor Cawthra, J. E. Osborne, Duncan Coulson, David Faskin, James Hawes and Arthur Hawkes, all of Toronto; J. J. Pangman, secretary of the Montreal Stock Exchange; W. Earle Hidden, a well-known metallurgist; Wm. Starr Bullock, Henry E. Woodworth and J. H. Cody, from New York; Harold S. Sims and W. F. Bartholomew from Boston. Their time was largely spent in a close examination of the veins now being worked at the Nipissing mine, where lunch was provided by the superintendent, Mr. Linney, each guest being presented with a silver nugget as a souvenir. The personal inspection of the wealth of Cobalt camp by so many leading financiers is regarded as an important step toward inspiring the public with confidence in Cobalt stocks, of which many brokers have hitherto been shy.—— Another rich find has been made on Lot 1, Concession 3, of Coleman township in the extreme southeastern section of Cobalt camp by Andrew Devine. The claim has been passed by the inspector, who declares the vein to be one of the best he has seen. The mine has been acquired by the Beaver Silver Mining Co., the prospector retaining a three-eighths interest.—— At Gillies Depot, five miles to the southwest of Cobalt town, W. H. Dickson has struck some promising cobalt-silver veins. The formation in this neighborhood is reported to be the same as that around Kerr lake.—— A nugget of almost pure silver has been found in working vein No. 26 at the Nipissing mines, quite near the surface. It weighs at least 100 lb.—— Edward Clark, manager of the Montreal Navigation Co., which is doing an extensive business in taking prospectors up the Montreal river, confirms the stories of rich finds of pure silver in that direction. At least two genuine discoveries have been made at Portage bay.—— Active prospecting is going on in the Temagami forest reserve, although the Government endeavors to discourage it, fearing the destruction of the timber by fire. Major Magee and W. R. Moore, of Ottawa, have located two pure cobalt veins, over two inches wide and also a nickel proposition on Kokoko lake. A gold discovery by an Indian is also reported. John Armstrong, formerly of Montana, is among those prospecting in the reserve.—— The Town Site Mining Co. has obtained from the Temiskaming and Northern Ontario Railway Commission a 999-year lease of the southwest 37 acres of the Cobalt townsite, which is known to be mineral land. It paid a cash bonus of $40,000 and in addition, agrees to give 25% of the gross value of every ton of ore, which has a value up to $1,000, and 50% on all ore worth over $1,000 per ton.—— A movement is on foot for the organization of a syndicate to acquire the mining rights to a large number of the remaining Cobalt townsite lots.—— The stock of the Trethewey Silver-Cobalt mine is being placed on the market. It is capitalized at $1,000,000 and the first issue of stock amounting to $300,000 is being offered at par.

In the House of Commons at Ottawa on June 12, Dr. Thompson, representative of the Yukon Territory, presented the claims of his constituents for a greater measure of self-government. He said he had the authority of experienced mining men for the opinion that more gold would be produced in the future than in the past. There were miles of auriferous gravel which capital would develop. Capital was coming in. The Guggenheim people were spending $2,000,000 on hydraulic and other machinery, and English capitalists were building a railway from Dawson into the gold district. In the southern part of the district, a quartz camp was being established. The Government should help in the way of securing water; an aqueduct was required to bring water to the gold-bearing deposits and provide means for their being worked. He presented figures to show that this would be a paying proposition.

TORONTO, June 11.

The army of prospectors in the Cobalt mining area and adjacent region has been largely re-inforced of late by the numerous college students and graduates, set free by the college commencements. The wonderful success of the three School of Practical Science men, Messrs. Blair, Kerr, and Glendinning, of the famous University mine, has had a widespread influence in directing the attention of college men to the opportunities offered by the mineral fields of northern Ontario.

Many new discoveries both in the Cobalt district and farther afield are reported, but it is not safe to accept all the reports which obtain publication at their face value. The most important, which is confirmed by Mining Inspector Mickle, who was in the immediate neighborhood at the time, was the finding of a vein of smaltite and calcite rich in silver ore on the property of the Temiscamingue Mining Co., Lot 1, Concession 3, of Coleman township. This extends the known silver area a considerable distance to the southeast. A find is also reported on Lot 6, Concession 3, Bucke township, three or four miles north of Cobalt, and about a mile north of the present mining operations. Prospectors up the Montreal river report valuable discoveries, but nothing definite as to happenings in that direction has come to hand.

Work on the smelter of the Cobalt Refining Co., at Hamilton, Ontario, is progressing rapidly and it is expected to be ready for operation in a couple of weeks. Nearly all the Cobalt producing mines will ship their ore to Hamilton for treatment. Several projects for the establishment of local smelters are being advanced, but the Hamilton enterprise has secured the start and seems most in favor with mining men. It is pointed out that the work can be more economically done at such a frontier point, as it will cost considerably less to ship the ore there than to bring fuel to Cobalt. In the meantime ore is being stored by most of the mines until the smelter is ready for it.

An incident of importance in relation to the question of the permanency of the Cobalt camp has recently transpired in the recovery of a lost vein in the Trethewey mine. Some time since a rich vein in the western working of the mine was lost and it was conjectured to have petered out against the adjoining greenstone or Keewatin formation. The matter was kept quiet, because it tended to indicate the shallowness of the deposit. The lost vein, however, was found to have been faulted and it has been struck again at a distance of eight feet, yielding as rich as ever. Prospecting work carried on by the Peterson Lake Mining Co. has resulted in the discovery of a promising vein of niccolite. A large number of prospectors have been at work at the Foster mine for some time and 20 pronounced veins have been located. Driving at the old shaft on the 50-ft. level has resulted in obtaining some very rich ore, four carloads of which are awaiting shipment. It is predicted that the returns from this consignment will create a sensation. A new vein five inches wide carrying rich ore has been struck at the McKinley & Darragh mine. The locality where it was found was prospected some time ago and regarded as non-productive. Preparations are being made for active development work at the Columbus mine and the contract has been let for the sinking of a double-compartment shaft 110 ft. Shafts are also being sunk at the Savage and Silver Bar mines.

The preliminary report on the experiments recently made in the electric smelting of Canadian iron ores by Eugene Haanel, Dominion Superintendent of Mines, has just been issued by the Canadian Department of the Interior. The object of these experiments was to establish the feasibility of the process as applied to Canadian conditions, the most important points to be settled being whether magnetite, the leading Canadian iron ore, could be smelted by electricity as easily as hematite; whether ores comparatively high in sulphur but containing no manganese, could be made into marketable pig iron; and whether charcoal could be substituted for coke as a reducing agent. The last point was considered specially important, charcoal and peat-coke being domestic products, while coal-coke has to be imported into the provinces of Ontario and Quebec. The report goes fully into detail with regard to some of the experiments of special interest and importance, giving analyses of the raw material and output. It is claimed that notwithstanding some defects in the construction of the furnace, rendering it impossible to provide for utilizing the calorific energy of the carbon monoxide resulting from the reduction of the ore, and causing unnecessary combustion of charcoal, the experiments have solved satisfactorily all the points to be decided. There was not the anticipated difficulty in the smelting of magnetite by reason of its conductivity, and charcoal, when crushed to pass a three-quarter inch ring, could be used as a reducing agent without being briquetted with the ore. The report expresses the opinion that probably the largest unit which can be constructed on the model of the experimental furnace, will not exceed 1,500-h.p. The construction will require to be modified to provide for the collection and utilization of the carbon monoxide and also to protect the charcoal charge from combustion on the top of the furnace. These changes and the fact of the greater capacity insuring less loss of heat from radiation will materially increase the output beyond that ascertained by the experimental furnace. The experiments indicated that under normal conditions about 11.5 tons of pig iron were produced by an expenditure of 1,000 e. h. p. days, so that for the purpose of calculating the cost of production it is assumed that, with a properly constructed furnace, the output of a similar expenditure of power would be 12 tons. On account of the value of the product the smelting of roasted nickel pyrrhotite, as carried out by the experimental plant, admits of commercial application without further modification of the furnace than increase of its capacity. The number of runs made during the demonstrations was about 150, and the total output about 55 tons of pig iron. Eight different classes of iron ore, principally magnetite, were used. On the authority of P. Heroult, the report estimates the cost of a 10,000-h.p. plant with a capacity of 120 tons of pig iron per 24-hr. day, at $700,000. The cost of production per ton of pig iron is calculated at $10.69. In addition to the results mentioned, the experiments have shown that ores of high sulphur content not containing manganese can be made into pig iron containing only a few thousandths of one per cent of sulphur; that the silicon content can be varied as required for the class of pig iron to be produced, and that titaniferous ores up to perhaps five per cent titanic acid can be successfully treated by electric process.

BUTTE, June 16.

The net earnings of all the Butte copper mining companies for the year ending June 1 amounted to $17,336,650.56 against $9,939,969 the preceding year. The net earnings of the various companies were as follows:

Companies.	1906.	1905.
Boston & Montana	$6,158,109 56	$5,855,620
Anaconda	5,753,265 42	2,259,694
Butte & Boston	1,075,892 79	178,713
Parrot	277,015 36	328,107
Trenton	541,528 54	70,110
Red Metal (United Copper)	1,035,206 03	606,953
Original	647,624 10	349,387
North Butte	1,848,008 76	291,385
Total	$17,336,650 56	$9,939,969

The Parrot Co. alone showed a decrease. The Washoe Co., of the Amalgamated, invested all of its earnings in smelter improvements, amounting to $532,883.81. Abstracts of the reports of the different companies, which here follow, give some interesting details of operations, cost of mining and reduction per ton of ore, gross yield per ton and other information.

Boston & Montana Mining Co.—Mines operated: Mountain View, Pennsylvania, Leonard, West Colusa, East Colusa, Greenleaf and Badger State. Tons of ore extracted, 1,209,805; gross yield per ton, $12.82; cost per ton to extract and mine, $3.46; place of reduction, Great Falls, distance 172 miles; total cost of transportation, $1,129,547.14; cost of reduction per ton, $2.45; expended for labor, $3,886,744.94; expended for machinery, $63,254,429.73; marketing charges, including refining, freight, selling charges, etc., $1,081,000.68; gross proceeds, $15,509,832.05; total expenditures, $9,351,722.49; net proceeds, $6,158,109.56.

Anaconda Co.—Mines operated: Anaconda, Never Sweat, St. Lawrence, Mountain Consolidated, High Ore, Bell, Gallatin and J. I. C. Tons of ore extracted, 1,521,310; gross yield per ton, $10.92; cost per ton for extraction, $3.63; place of reduction, Anaconda, 27 miles; total cost of transportation, $231,999.25; cost per ton for reduction, $2.27; paid for labor, $4,394,103.02; expended for machinery and supplies, $4,088,224.88; marketing, etc., $1,645,943.94; gross proceeds, $16,613,137.01; total expenditures, $10,860,371.59; net proceeds, $5,753,265.42.

Butte & Boston Co.—Mines operated: East Gray Rock, Silver Bow, Blue Jay, Berkeley. Tons of ore extracted, 246,593; gross yield per ton, $11.44; cost per ton

for extraction, $3.51; total cost of extraction, $866,357.81; reduction at Anaconda; total cost of transportation of ore, $49,318.62; cost per ton of reduction, $2.06; total cost of reduction, $509,028.03; paid for labor, $869,647.02; paid for machinery and supplies, $505,738.82; marketing, refining, etc., $320,722.24; gross proceeds, $2,821,319.49; total expenditures, $1,745,426.70; net proceeds, $1,075,892.79.

Washoe Co.—Mines operated: Moonlight, Cambers and Clear Grit. Tons of ore extracted, 95,210; gross yield per ton, $12.05; cost per ton for mining, $4.33; reduction at Anaconda, cost per ton, $2.73; marketing, etc., $97,764.35; paid for improvements, $532,883.81; gross proceeds, $1,146,981.03; total expenditures, $1,322,702.25; expenditures in excess of receipts, $175,721.22.

Parrot Co.—Mines operated: Parrot, Bellona, Original and No. 6. Tons of ore extracted, 163,569; gross yield per ton, $8.54; cost per ton to mine, $3.65; place of reduction, Anaconda; total cost of transportation of ore, $29,442.42; cost of reduction per ton, $2.16; marketing, selling charges, etc., $141,281.75; gross proceeds, $1,397,406.82; total expenditures, $1,120,391.46; net proceeds, $277,015.36.

Trenton Co.—Mine operated: Gagnon. Tons of ore extracted, 168,770; gross yield per ton, $9.18; cost per ton for extraction, $2.92; reduction at Anaconda, total cost of transportation, $25,315.47; cost of reduction per ton, $2.09; marketing, selling charges, etc., $131,422.20; total expenditures, $1,007,570.89; net proceeds, $541,528.54.

North Butte Co.—Mines operated: Speculator group. Tons of ore extracted, 259,650; gross yield per ton $21.11; cost per ton for extraction, $4.47; reduction at Anaconda, total cost of ore transportation, $52,017.23; cost of reduction per ton, $4.84; paid for labor, $646,281.35; machinery and supplies, $514,484.86; improvements and investments in mines, $1,164,000; gross proceeds, $5,480,545.24; total expenditures, $3,632,531.48; net proceeds, $1,848,008.76.

Red Metal (Butte Coalition Co. from Feb. 1 to June 1.)—Mines operated: Rarus, Minnie Healey, Corra and Belmont. Tons of ore extracted, 149,101; gross yield per ton, $12.94; cost per ton for extraction, $3.94; place of reduction, Basin, Mont.; total cost of transportation, $89,460.60; cost per ton for reduction, $3.94; paid for labor, $547,005.97; expended for machinery and supplies, $628,151.20; marketing, etc., $223,651.50; gross proceeds, $1,929,568.17; total expenditures, $1,488,269.27; net proceeds, $441,298.90.

Montana Ore Purchasing Co. (now Red Metal, from June 1, 1905, to Feb. 1, 1906, eight months).—Mines operated: Rarus, Corra and Minnie Healey. Tons of ore extracted, 274,322; gross yield per ton, $8.83; cost per ton for extraction, $4.38; total cost of transportation, $69,129.14; cost per ton for reduction, $2.04; gross proceeds, $2,423,086.22; net proceeds, $593,907.13.

Original Co.—Mines operated: The Original and Stewart. Tons of ore extracted, 316,466; gross yield per ton, $8.61; cost per ton for mining, $3.47; total cost of transportation, $63,152.56; cost per ton for reduction, $2.90; paid for labor, $727,390.48; paid for supplies, $370,998.99; net proceeds, $647,624.10. Royalties received on other Clark properties, $866.34.

Alice Co.—Tons of ore extracted, 3,831; gross yield per ton, $8.23; cost per ton for extraction, $9.76; gross value, $31,524.81; loss in operations, $5,871.07.

Following is given in tabulated form a resume of the above:

COMPANIES	Gross yield per ton	Cost per ton for mining	Cost per ton for reduction
Boston & Montana	$12 82	$3 46	$2 45
Anaconda	10 92	3 63	2 27
Butte & Boston	11 44	3 51	2 06
Washoe	12 05	4 33	2 73
Parrot	8 54	3 65	2 16
Trenton	9 14	2 92	2 09
North Butte	21 11	4 47	4 84
Red Metal	12 94	3 94	3 94
Montana Ore Purchasing	8 83	4 38	2 04
Original	8 61	3 47	2 90
Alice	8 23	9 76	....

The engineers in the employ of the Amalgamated and Butte Coalition Co. have arrived at an agreement for a division of the disputed orebodies which for years were in litigation between the Amalgamated and United Copper Co., the latter the predecessor in interest of the Butte Coalition. The terms of settlement and division have not been made public, but have been taken to New York by B. B. Thayer, assistant to H. H. Rogers, president of the Amalgamated, and they will be laid before the directors of each company for approval. As soon as the boards formally pass on the reports, the various mines which have been closed by injunction for many years, will be reopened.

The Coalition Co. has already begun sinking a shaft on the Tramway, one of the mines that has been in litigation, and will sink it to 1,800 ft. The Parrot, also, has begun mining on one of the veins from which it was excluded by an injunction for a number of years.

The Raven Mining Co. has suspended operations. Its best mine, the Snoozer, was operated through the shaft of the Buffalo mine, owned by the Anaconda Co., but it had no lease on the shaft. Last week the Anaconda Co. closed the shaft to the Raven Co. and will use it in developing some of its own properties. The old hoisting building is being torn down to obviate the danger of fire, and it is stated by officials of the Raven that as soon as the work is completed the Anaconda Co. will hoist Raven ore under an arrangement that will be better for the Raven than the old one. The Raven does not own all of the Snoozer mine, the Butte Coalition owning an eighth, and under Montana laws, the owner of an interest can not operate a property without the consent of the co-owner, so that at any time the Coalition Co. can, if it wishes, completely stop operations in the Snoozer. In order to reach the Snoozer the company is working by means of a tunnel driven through the property of the Old Glory Co., and the latter has, for a long time, been threatening injunction suit.

It has been officially announced that the Washoe smelter at Anaconda is to be materially enlarged and that an expenditure of $600,000 for that purpose has been authorized. It is the purpose of the company to increase the plant so that its monthly output will be 20,000,000 lb. copper. The plans provide for a complete electrical installation in the concentrator plant and a partial electrical installation in the smelter power-house. In the latter plant the power required not generated by the waste-heat boilers, will be developed by electricity when the new system is completed. Eight roasters will be added and also another 112-ft. reverberatory furnace. A new blast furnace 87 ft. long will be put in, the largest ever constructed. Two stands of converters will be added in order to take care of the increased production of matte. Additional machinery will also be placed in all other departments of the plant. The enlargement of the Washoe is in addition to that which is to be done by the Amalgamated at its smelter at Great Falls, which is to be enlarged for a production of 10,000,000 lb. copper per month. All the ore for this enormous production at the two smelters will come from the mines of the Amalgamated Co. in Butte.

The Trenton Mining Co. is preparing to sink its shaft from the 1,900-ft. mark to 2,000 ft. The Gagnon mine, the company's only property, is now producing 600 tons of ore per day of a better quality than it had been producing in a long time.

SALT LAKE, June 18.

The Peck concentrating mill, built to treat the zinc ore of the Horn Silver mine, at Frisco, Beaver county, has been closed to undergo alterations and enlargement. The plant was built originally to treat from 300 to 400 tons daily, but has failed to do it. Results from a late run showed a satisfactory separation of zinc, the zinc concentrate running 50% and the lead concentrate from 45 to 55%. Shipments of ore are about to be made from the Indian Queen mine, near Newhouse, Beaver county. This property is said to be under option to James F. Burns, of Cripple Creek.

The Sacramento Gold Mining Co. of Mercur, Glen R. Bothwell and R. E. McCaughnahay, president and secretary, respectively, have filed answers in two actions for $231,000 damages and trespass brought by the Herschel Gold Mining Co. Defendants deny that the ore in question belonged to plaintiff as it was mined during the life of an agreement entered into in 1893 between the two companies, which specified what ore the defendant was entitled to, and that the ore taken out was not in excess of that amount and was extracted with the knowledge and consent of plaintiff.

The Daly-Judge Mining Co., operating at Park City, made a net profit on its May operations of approximately $55,000, while the expense was about $23,000. The company has enough money on hand to clear up all its indebtedness, which will be liquidated within the next ten days.——An important strike has been made in the New York Bonanza mine, at Park City, where an east drift on the 700 level has encountered a three-foot vein of high-grade silver-lead ore; it is said to be the best ore ever opened in the property.——Good progress is being made with the drift alongside the caved section of the Ontario drain-adit at Park City. Hard rock has been encountered, removing the necessity of timbers. The adit has been closed since March, 1904, which has greatly interfered with the development of orebodies of some of the principal mines of the district.——The labor troubles of the Daly-West Mining Co. are seemingly at an end, the company consenting to make it discretionary with the miners whether they use candles or the lamps, the introduction of which by the management caused the recent difficulty.

The management of the new smelters, now nearing completion at Garfield, on the south shore of the Great Salt lake, had some experience with labor troubles last week. A lot of Greeks quit work and attempted to take matters in their own hands by resorting to intimidation. Armed with clubs and stones they drove nearly every employee from the works, threatening to kill anyone who did not leave. The sheriff of Salt Lake county, with 50 armed deputies, arrested 26 of the leaders and 81 were deported, which put an end to the difficulty. Some of the mining companies of Bingham have had trouble with Greeks and some of them have concluded not to give employment to men of that nationality in the future.——The new sampling mills at the Garfield smelters will be ready for business some time next week. It is expected the blowing-in of the first furnaces will take place a few days later.

The Sunday mine, in American Fork canyon, which was a producer of consequence 30 years ago, is to resume operations. The property is owned by Chicago and Duluth people who have organized the Sunday Mining Co. Charles Crane, of Chicago, is manager and will take charge of the work, making his headquarters at American Fork.

The ore and bullion settlements reported last week by Salt Lake banks aggregated $450,600.

Ore shipments from the Tintic district last week aggregated 156 carloads, the shippers and amounts being: Ajax, 2; Beck Tunnel, 5; Black Jack, 12; Bullion-Beck, 7; Carisa, 8; Centennial-Eureka, 33; Dragon Iron, 16; Eagle & Blue Bell, 5; Eureka Hill, 2; Gemini, 13; Godiva (concentrate) 1; Grand Central, 6; Mammoth, 18; May Day, 3; Ridge & Valley, 3; Scranton, 3; Swansea, 3; Uncle Sam, 4; Victoria, 4; Yankee Consolidated, 6; other mines, 1.——The Scranton zinc mine in North Tintic is working 35 men and shipping 40 tons of ore daily to Colorado smelters.——The Anadale fraction mining claim, adjoining the Centennial-Eureka mine of Tintic, has been sold to Elmer Jones of Salt Lake and associates, it is said, for $25,000.——The Mammoth Mining Co. continues development below the 2,200 level with satisfactory results, and the management reports that the mine has not looked so well in years as it does now. Production has been handicapped by a scarcity of water.——Tintic operators are working for a low tariff on ore to the Salt Lake smelters. The transportation companies have been asked to make a $1 per ton rate on ore having a net value of $10 or less per ton; $1.50 per ton on ore having a net value of $20 per ton or under, and $2 per ton on ore netting above $20. At present the minimum rate is $1.50 per ton on ore not exceeding $15 per ton and $2.50 on all ore going above $15 per ton. The operators insist that they should be granted these concessions, which would enable them to market, profitably, large amounts of low-grade ore which now has little commercial value.——The management of the Beck Tunnel Consolidated of Tintic district has established a minimum wage scale of $3 per day.

The South Columbus Mining Co., operating at Alta, has resumed development and is continuing its tunnel.——The Pioneer Mining Co., at Alta, is pushing work in an adit, now in over 500 ft., and which will tap known orebodies 500 ft. further in.

The Buckhorn mine, at Ophir, which adjoins the Ophir Hill property of W. A. Clark, is now controlled by Duluth parties who have organized the Cliff Mining Co. A. D. Johnson, of Duluth, is president; W. F. Snyder of Salt Lake, vice-president; A. L. Kern, of Milwaukee, treasurer; R. M. Atwood, of Helena, Montana, general manager. The property is to be equipped with new machinery and an aerial tramway. Some large orebodies have been developed in this property.

The directors of the Carbonate Hill Mining Co., operating in Morgan county, have authorized the equipment of the mine with an air compressor, power drills, and aerial tramway. M. A. Daugherty of Salt Lake is manager.

Much interest is being taken in the mining districts of the Deep Creek country in the west line of the State by a number of men who have been prominent in the development of Goldfield, Nevada. A great deal of bonding of properties is going on and indications are favorable for much activity in that section later in the year.

The Bingham Mines Co. has been organized to operate in Bingham. It has acquired property in the upper portion of the camp near the Boston Consolidated and United States mines. John Dearn is president; Charles W. Whitney, vice-president; Frank Knox, treasurer, and P. B. Locker, secretary, all of Salt Lake. Its territory embraces 250 acres.

MINING SUMMARY

ARIZONA.

COCHISE COUNTY.

A bond on the Copperopolis mine at Paradise is held by E. F. Sweeney of Paradise and Geo. H. Crosby of Duluth, Minn. Three payments have been made, the fourth and last being due in August. Present owners of the Copperopolis are: G. B. Richardson, M. R. LaRue and Geo. H. Crosby, the last mentioned having purchased the interest of P. G. Carney. The group consists of eight claims and lies near the center of the district. The mineralized zone is 60 ft. wide on the west, to 600 ft. on the east, extending through three claims. The iron out-crop is visible here and there throughout the entire length. At intervals sulphide of copper is discernible in rock at the surface and one can dig up with the hand or detach with a hammer, good copper ore which is found mostly in limestone, though sometimes also in porphyry. Ore is also found with green, brown and yellow garnets and hematite is present almost everywhere in large quantities. Samples run from 8 to 20% copper. Lead is also found in most of the workings.—— The best showings are on the Blue Bell and New Year claims. On the Blue Bell there are several adits from which good ore was taken. On the Copperopolis claim, which adjoins the Blue Bell, a shaft makes a good showing.

MARICOPA COUNTY.

A carload of rich ore from the Fortuna mine, 16 miles northeast of Phoenix, will be sent to the Humboldt smelter. It is said it will average $2,000 gold per ton. William Hoover, who discovered it, secured a lease on the mine and has been at work, though not constantly, for three months in getting it out and he has done all the work alone.

MOHAVE COUNTY.

Howard & Littlefield are making a run on ore from the Boulevard mine 15 miles north of Gold Roads, crushing it in the Pyramid Mining Co.'s mill, six miles from the mine. The Boulevard rock is free-milling gold ore of high grade.

YAVAPAI COUNTY.

The company, represented by H. J. Beemer, that holds a bond on the Storm Cloud claims on Mount Union, 15 miles southeast of Prescott, made a payment of $27,000 on the purchase price last week. There are 15 claims in the group, all of them showing well-mineralized veins. There was a good deal of development done when the Beemer people took hold of them, and now an adit is being driven and three shifts are putting down a shaft.—— The Senator Co. is driving an adit under Mount Union, now in 3,000 ft., and has cut several veins of good ore, the best being that of the Ten Spot.—— For several weeks pumps have been unwatering the Octave mine at Antelope Hill. Shaft No. 2, on that property, has been unwatered and 80 ft. of sinking done since the water was taken out. The result of the work is satisfactory. This shaft is now down 1,640 ft. At 1,500 ft. there was a squeeze, but the workings are now in a strong vein. The force of 20 men will be doubled inside of 30 days.

CALIFORNIA.

BUTTE COUNTY.

Los Angeles capitalists are reported to have bought the A. F. Hornung place near old Diamond, comprising 120 acres, and intend to mine it with steam shovels, the machine working on the ground instead of in water. Another Los Angeles company has bought 60 acres at Rich Bar on Butte creek and will also install a steam shovel and sluices.—— A third company has taken the R. F. Ferguson property of 150 acres across the creek from the Rich Bar and will work it in a similar manner.

EL DORADO COUNTY.

At the Mount Pleasant mine, at Grizzly Flat, the north shaft is being sunk from the 1,000 to the 1,100-ft. level. Three eight-hour shifts are working. At the 1,100-ft. level cross-cuts will be run to the ore-shoots——A number of men are making an examination of the Georgia Slide mines. So far the prospects are favorable.

MONO COUNTY.

It is reported at Bodie that the Standard Consolidated Co. is planning to enlarge its cyanide plant and also the power plant at Green creek, the object being the more economical handling of the tailing accumulated.

NEVADA COUNTY.

It is reported that the Norambagua mine on Deadmans Flat, near Nevada City, is to be sold. An examination, in the interest of southern California men, is being made. Years ago this mine produced rich ore, but lack of capital finally led to a cessation of work. Some months ago operations were resumed, the long adit being cleaned out and retimbered.

The New York-Grass Valley mine, near Grass Valley, has purchased land adjoining its mill, on which to erect a large cyanide plant now under construction in San Francisco. At the Central Consolidated, the owners, failing to receive the electric pump from the East, have put in a bailing-tank, which is steadily lowering the water. Development will be carried on in the old workings on a large scale.

It is reported from the Zeibright mine, in Little Bear valley, that a rich strike had been made in the upper adit, which had been running through barren rock for the last 130 feet.

PLACER COUNTY.

The Valley View copper mine, near Danetown, is again to be unwatered for the purpose of examination by prospective purchasers.

SAN BERNARDINO COUNTY.

A rich strike of lead-silver ore is reported seven miles west of Daggett, in an old mine discovered in the early days of Calico. There is very little lead in Calico district, but the hills lying south of the Calico range and extending westerly from Daggett contain numerous deposits of lead-silver ore. Ore from the new strike is to be shipped.——The Paradise Mining & Milling Co. will soon build a mill at its mine near Paradise Springs, 15 miles north of Daggett. The Poliets property will be worked by this company.——It is reported that Samuel Newhouse has bought the New York mine on the northeast end of New York mountains, three miles west of Manvel. This mine is the oldest in that part of the San Bernardino copper belt. It has been developed and some rich ore found.——New York mountain is dotted with camps, and development of copper veins is active.

SHASTA COUNTY.

Machinery has arrived at Redding for the Washington mine, near French Gulch. The mine is to be equipped with machine drills, gasoline engine and compressor. Walter Van Matre is superintendent. The Washington was a large producer in years gone by. Charles Webb, a lessee, struck it rich a few months ago, cleaning up several thousand dollars. When this lease expired, three or four months since, he could not get a renewal. Rich ore was left in sight when Webb quit. To get at the orebody more advantageously an adit was run 200 ft. lower, which will be driven 500 ft. before the vein is struck.

The Brunswick mine, near French Gulch, has been sold to H. D. Lacy of New York, who paid Francisco B. Rossi $39,000 and gave a mortgage on the mine for the payment of the $20,000 additional within six months. A payment of $1000 was made several months ago. The Brunswick mine was successfully worked 20 years ago. It was supposed to be worked out and had lain idle for several years before Mr. Rossi took hold of it. The new owner will install a stamp-mill on Willow creek and another adit will be run to tap the vein 300 ft. lower than the present workings, for which surveys are now being made. It will be 1,200 ft. long. Mr. Rossi will be retained as superintendent.

The **Mammoth Copper Co.** has made an important change in supplying water to the smelter. Heretofore, two centrifugal pumps, each of 500 gal. capacity per minute, have raised the water from Backbone creek to tanks above the smelter. Water will now be taken from the Butters' ditch, which passes above the smelter. The Butters' water system is nearly completed. When finished the total cost will approach $40,000.

SIERRA COUNTY.

(Special Correspondence).—The Sierra Buttes Co. has its 20 and 40-stamp mills running steadily.—— The Sierra Alta, or Keystone, has a large force and the mill is running full time.—— The San Jose Co., that has Jack Hayes' property bonded, has recently struck a large body of ore showing gold. They claim to have enough in sight to justify a mill and will erect one as soon as they can get it on the ground.—— The Marguerite Co. has installed large pumps and expects to have the shaft clear of water soon.—— The Sovereign opened up a large body of free-milling ore the past winter and are going to make a test run in the Primrose mill.——The Empire Co., in Gold Valley, is running 25-stamps on good ore.——John Buckingham is erecting a 5-stamp mill on his mine in Jim Crow canyon. ——C. J. York, owner of the Downieville foundry, is building a 5-stamp mill for custom work, a commendable and necessary enterprise, which will probably be the means of developing a number of good prospects in this vicinity.——There is a new district being opened in the eastern part of this county near Loyalton, where a number of Truckee and Reno people have recently made locations.——S. L. Jones, A. C. Hamilton and W. S. Hoskins have recently been making an examination of the Tightner mine to determine what is necessary in the way of machinery to continue future development.——The California Debris Commission has granted the Alleghany Mining Co. a permit to construct a restraining dam on its property near the town of Alleghany.——The South Fork Co., at Forest, has its main adit in 4,000 ft. and thinks it is in the west rim of the channel and expects to strike gravel soon.——S. H. Shaw, while prospecting for gravel in Rattlesnake ravine, was killed by the accidental explosion of nitro powder on May 29.—— The Telegraph mine has sunk an incline in good gravel and is preparing to run gangways and breast out. It has also installed a Cornish pump in its quartz shaft and will resume sinking.——The Golden Scepter has closed down temporarily and the Herkimer expects to strike pay gravel any day.

Downieville, June 14.

SISKIYOU COUNTY.

An electric line is being built to the Morrison & Carlock mine in Quartz valley for running the mill, hoists and other machinery. This company now employs 40 men.——The Golden Eagle quartz mine, at Indian creek, operated by A. C. Brokaw, is yielding good returns, working day and night. The New York mine will probably be started up again shortly, as the squabble among directors and stockholders has been settled. ——Improvements are being made in the Mono mine on Punch creek, Humbug district. The equipment comprises a 10-stamp mill run by electricity, and a cyanide plant.——The Brooks mine, on the east fork of Eagle creek near Gilta, purchased by P. L. Young of Orleans Bar, is now showing up well, a vein having been cut ranging from six to ten feet that assays well.——The mill at the Highland mine at China Basin is running on rich rock. The mine has produced nearly $200,000, and has hardly left the grass roots. A lower cross-cut adit is now being driven.——Work at the Advance mine is under the management of Chas. Ritz. The orebody is said to be showing up well in the lower level. Several hundred tons of ore, now on the dump, are being transferred to the mill, which is running under the management of Naylor and Martin. Louis Cory is looking after the interests of the original owners of the property.

TRINITY COUNTY.

The June rains this year have made a marked difference in the placer mining season. All the mines in the vicinity of Weaverville are running full blast. At the Testy mine the water has kept up well and at the Hupp mine, which is being opened in a new channel, the bank is increasing in height daily. The gravel is free and easy to wash. In addition to the mine work, a new public road was constructed on East Weaver creek which has been recently improved by the building of an easy grade from the creek to Harvey flat. The total rainfall to date is 41.70 in., as against the total of 41.31 in. for the entire year ending June 30, 1905.

YUBA COUNTY.

The Bessie quartz claim is the newest mine in Brown's valley, twelve miles from Marysville. Byron Burris, the owner, has sunk a shaft 100 ft. and in a drift at that point, has broken into a vein that shows gold. The find is supposed to be a southerly extension of the Old Flag. Eight men are at work in the mine.

COLORADO.

LAKE COUNTY.

A sensational discovery of rich float quartz assaying 40 oz. gold per ton, is reported made on the Tennessee fork of the Arkansas river, seven miles west of Leadville. It is thought by many that the discovery means the opening of a new mining district that will rival the Cripple Creek section in size and value.——A discovery of rich gold ore is reported in the Ibex, or Little Johnny, at Leadville, by Robert Walker and Logan Hawkins, lessees. While working in one of the stopes they encountered a pocket of ore from which, in a few hours, they took out and sacked 110 lb. of ore that returned $25,000. The mass of gold mixed with white waste was five feet high, two feet wide and an inch thick. The Ibex company will receive 65% of this gold and the lessees 35%. Another find of 57 lb. of ore was recently made which yielded $13,680. This gold was sold to eastern banks for specimens and brought more than $20 per ounce.

OURAY COUNTY.

At the Camp Bird, work is being pushed in the replacing of the mill destroyed last spring by a snowslide. Nearly 100 men are working upon the excavations and rough work, while 30 carpenters are engaged in framing timbers. The stamps and other machinery have been purchased, mostly in Denver, and they will be installed as soon as the buildings are complete, which it is thought will be by September. Fourteen men are at work at the mine doing development work, and no

more can be employed until the mill is finished and the tramway repaired. When mining begins again the waste rock will be trammed down and used for the purpose of constructing a break and guard against future snowslides. At miners' union headquarters in Ouray a call was received last week from mines in the district for single and double-hand hammers-men; a class of miners that seems to be growing scarce in the San Juan country since the introduction of machines. Machine men and helpers now command the highest wages in the mines, $4 and $4.50 for eight-hour shifts.——One of the most extensive mining enterprises to be worked in the San Juan country this season is the Treasury adit and the combination of other interests which has been made with it. The adit will be run in the direction of the Tomboy mines. This means employment of 1,000 men in the Red Mountain and Ironton districts. The ore will go out through Silverton, but the men and supplies will be largely drawn from Ouray.——Interesting complications will arise out of the adjustment of the loss on the Camp Bird mill in Ouray district, which was wrecked by a snowslide several days before the fire. It has been found that two warehouses containing the mill-supplies and other material higher up on the mountainside, had been swept down by the snowslide and were dumped into the mill, where the debris afterward was destroyed by fire. As the property was insured in the other location, an interesting point in the adjustment is expected. The insurance companies are reported to have offered to compromise the loss on gold in solution at $149,000, the total insurance being $200,000.

SAN MIGUEL COUNTY.

The Silver Bell mine at Ophir Loop, under lease to H. H. Hutton and Frank Trumble, is reported as successful this season, since getting the mill in operation. About 30 men are on the pay-roll and a lot of good ore is being produced. The ore is sorted and a good part of it shipped, the rest being treated at the Bell mill, 10 stamps of which are constantly in use. The proposition is not operated on a large scale, but it makes dividends for the lessees. Mr. Hutton has charge of the mill and Mr. Trumble is mine boss.—— It is reported that damage had been done the Keystone placer buildings by the high water in San Miguel river. The channel, which was formerly 18 ft. wide, became a torrent fully 150 ft. in width, carrying down boulders weighing tons. Wm. Leslie, the watchman for the company, was awakened by a crash and looking out found that the cook house, compressor house, blacksmith shop and stable had disappeared and the place upon which they stood was a swiftly moving stream. The only building remaining being the old boarding house which stands up 50 ft. from the river bed, the balance of the ground being washed out during the night.

TELLER COUNTY.

The Elkton Co., at Cripple Creek, has increased its output to one car per day, the ore being obtained in its sixth, seventh and eighth levels. Cross-cutting is being pushed on the fifth level for the orebody cut in the third.——Frank Caley has sunk the shaft in his Arapahoe lease on the Jerry Johnson, on Ironclad hill, to a depth of 600 ft., and has found mica schist in a cross-cut. This is believed to be an alteration of the granite, and it is expected ore will soon be found.—— Machinery has arrived at the shaft on the northeast corner of the Mabel M. ground on Raven hill. The work will be done by Murray, Ragland & Husted, lessees in the camp, and 630 ft., or water level, in that section of the camp will be reached before doing level work. It is proposed to cut the Requa-Savage orebody which enters the Mabel M. ground at 400 ft., and is described as being six feet wide and rich.——The second mine of the district today is the Granite, with two deep shafts, on Battle mountain. The mine sent out, during May, 120 cars of ore, and is outputting four cars per day. Most of this production comes from the hill shaft, which is 1,000 ft. deep. About 75 tons are being hoisted through this shaft, the remainder coming from the Gold Coin shaft of the Granite Co. at Victor. About 45 tons per day are being raised there, mined from the 700 to 1,000-ft. levels. This shaft is filled with water from the 1,200 to the 1,000-ft. levels, and no efforts will be made to drain it until it is relieved by the new deep drainage adit. There are several sets of lessees working in the Granite property, in either shaft, the grade of ore secured by them averaging about two ounces.——The Granite is in charge of Allen T. Gunnell, Jr.——Lessee Boynton is making regular shipments from his lease on the dump of the Granite mine. Four cars were shipped during May, and a corresponding rate of output is being made during June.

(Special Correspondence).—The Darnell lease on the little May, on Beacon Hill, is shipping three cars of ore per month, which averages $30 per ton. The shaft is down 230 ft. and is equipped with electric hoist. This property is part of the El Paso holdings. While the lessees strike some rich streaks at times, the lease is not considered high grade.—— The El Paso mine, on Beacon Hill, encountered a large flow of water below the present drainage adit some months ago, and being unable to handle it with their big pumps, have abandoned work below the adit level. They have enough ground above it to keep them working for two years. —— The new drainage adit does not materialize as rapidly as was hoped. It is believed by many in the district that the necessary funds will be raised and that the adit will be driven. Unless this adit becomes a reality it will not be many years before several of the large producers in the district will be forced to close down on account of water.—— The Henry Adney mine, as well as the Union Leasing Co., is doing considerable work in the vicinity of the El Paso mine.—— R. S. Prettyman, manager, and J. B. Truitt, superintendent of the Iron Clad Mill Co., are operating the mill of the old Homestake Co. on Iron Clad hill, and claim to be making a good saving. The ore averages $2.36 per ton. The mining expense is about 32c. per ton, and mill treatment, including power and water, 70c. per ton. J. W. Price has taken a lease on the Montrose, adjoining the Forest Queen, on Iron Clad hill, and has started a shaft.—— Geo. D. Kilborn, general manager of the Isabella Mines Co., is authority for the statement that his company will erect a large cyanide mill to treat the dumps which contain several hundred thousand tons. Some of the dump runs as high as $6 to $8 per ton. Mr. Kilborn states that his company has made exhaustive tests of the ore and is satisfied they can handle it at a profit by the cyanide method. He expects to have the mill in operation by January 1907. He is shipping two cars of ore per day to the smelters.

Cripple Creek, June 14.

IDAHO.

IDAHO COUNTY.

Owing to the late heavy snows, all the mines of Buffalo Hump district have been closed. There will be abundance of water for placer mining operations throughout the summer season.—— James Surridge, general manager of the Newsome Legget Mining Co., says his company has expended over $30,000 developing its placer property and is opening up one of the largest gold bearing gravel deposits in Idaho. It has reached a depth of 140 ft. without finding bedrock. Fine gold is found from the grass roots down, and the property is now being worked at a profit. Two giants are operated day and night.

NEVADA.

CHURCHILL COUNTY.

At Fairview several properties are producing ore in quantities. The Nevada Hills is sacking $300 to $500 ore from four openings within a distance of 1,600 ft. along the vein. On this vein, a few hundred feet distant, are the properties of the Ida Mines Co., where systematic trenching is in progress to determine the course of the veins and position of the ore-shoots.

ELKO COUNTY.

An important strike is reported in the Protection mine at Mountain City, operated by Wm. Willis. In a 900-ft. adit, being run to open up the main vein, a large body of white quartz has been cut. Selected ore assays $800 gold and $3,500 silver. For two years Mr. Willis has been engaged in development work. He is preparing to put in a mill.

LINCOLN COUNTY.

(Special Correspondence.)—Progress in Searchlight district is now marked by visits from some well-known mining men. The San Francisco calamity has caused many to turn their attention to the Nevada mining camps with the hope of recouping their lost fortunes. W. H. Malone, of Denver, president of the Frier Hill mine, at Leadville, and A. A. McKnight, of Bullfrog, who are reported to represent Chas. M. Schwab, have left Searchlight, after having spent several days inspecting some of the most prominent mines here.——H. B. Adsit, of Denver, was also in Searchlight several days last week, when he acquired additional property and concluded arrangements to open headquarters here.——The final payment on the bond on the McGhan group has been made. This property consists of 20 claims situated at the northern end of the district and has been deeded to the Nevada Consolidated Mines (Ltd.). The company was organized by Geo. P. Spittall, of Philadelphia, last January to take over the McGhan group. At that time Mr. Spittall and associates took a year's working bond on the group, which, under the direction of F. O. Woods, has turned out so satisfactorily that the bond holders decided not to wait until the expiration of the stipulated time.——In El Dorado district, development is improving the Venus, and rich strikes are reported. Recent samples in the bottom of the shaft of the Venus averaged 20 oz. gold per ton. These samples were taken in sulphide ore, although there is some free gold in the rock. The management is sinking for the 200-ft. level and will continue cutting stations at each 100-ft. until the 500-ft. level is reached. Two shifts of three men each are employed in sinking the shaft.——Drilling machinery for the Black Hawk is on the way, and drilling for water for mill purposes will begin immediately on its arrival.——Preparations are being made to begin a 500-ft. shaft in the Mountain-El Dorado group. ——The Nevada-El Dorado at the 200-ft. level has uncovered ore which is reported to run $75 per ton. Drifting has begun. There is a large quantity of high-grade free-milling ore on the dump, which, as in many other cases in this section, is being held for shipment until the railroad, now under construction, reaches Searchlight.

Searchlight, June 14.

(Special Correspondence).—Among the new companies recently organized here, is the Searchlight-Bronco Mining Co., which owns seven claims eight miles southeast of Searchlight.—— The Nevada-Searchlight has begun sinking an additional 100 ft. from its present depth of 80 ft. In following the hanging wall, the streak of good ore found on the surface has widened. —— The Cyrus Noble Mining Co. has been having trouble with the new electric pump recently installed, but it has been put in working order, and is now doing good service. Concentrators have also been installed, and are expected to raise the percentage of extraction. Sinking an additional 100 ft. will be begun at once.—— The Quartette Mining Co. reports having struck water in the Drake shaft at a depth of 238 ft. As the present flow is slight, sinking will continue, the expectation being that it will tap the Quartette-Cyrus Noble vein within the next 50 ft., and that with greater depth the flow of water will increase to such a quantity as to give an ample supply for the additional 20 stamps now being put in.—— The Wyoming-Searchlight, having reached the 200-ft. level, has suspended operations pending the arrival and installation of a hoist, the whip being inadequate for further depth. As this property is situated on the flat, its development is watched with interest, for, if successful, it will enlarge the proved area of the district. The value of the ore obtained at the 200-ft. level more than doubles that from the 100 level.—— The Cyrus Noble Extension Mining Co. is proving up better as the shaft goes down. Recent samples taken from the bottom of the 60-ft. shaft gave satisfactory assays, and sinking will proceed. A whip will be put in on this mine in a few days.——The Searchlight Mining & Milling Co. reports that it intends to enlarge the mill on that property to 20 stamps. Rich ore is being taken out and one small lot, milled last week, ran $2,000 per ton; the average is about $25 per ton.

NEW MEXICO.

DONA ANA COUNTY.

E. A. Franke, general manager of the Modoc Mining Co., at Organs, reports that the wet process, lately installed at the mines, is proving a success and that the mill is running at a profit.—— Geo. P. Courtney, assistant manager, at Dona Dora mines near Kent, reports having run into a rich silver-gold vein in the Oriental adit.

OTERO COUNTY.

The vein on the 200-ft. level of the Lucky mine at Jarilla is 20 ft. wide, and a new raise has been started in this level north of the shaft. The north drift on the second level has penetrated the rich body of sulphide opened on the first level.

SOUTH DAKOTA.

CUSTER COUNTY.

It is reported that the Harney Peak Tin Mining Co. is to be reorganized and will soon resume operations on a larger scale. The English and American factions in the company, have at last compromised their differences and agreed upon a plan of action. The necessary capital has been secured for development and putting the mills in order. The Harney Peak Co. is one of the largest owners of property in the Black Hills, holding several thousand acres in Pennington and Custer counties, embracing mineral and timber lands, and placer claims. During the former period of the company's activity, a number of shafts were sunk, exposing large bodies of ore. Two mills were erected but were never operated on a commercial basis. One plant at Hill City, costing a quarter of a million dollars, never turned a wheel save in a trial of the machinery—not a test upon the value of the ore.

LAWRENCE COUNTY.

The New England Homestake Co., sinking a shaft two miles above Deadwood, has put in a new and larger compressor. The shaft is down 175 ft. in hard rock.

PENNINGTON COUNTY.

At the Gertie mine, one mile above Hill City, on Spring creek, an incline shaft 500 ft. in depth has been sunk on ore the entire distance. A year ago, after exploiting the mine, E. C. Johnson, the owner, erected a one-stamp mill, and put in a Wilfley concentrator. After a quantity of tin concentrate had accumulated, a reverberatory furnace was built in which the ore was smelted. Excepting mining, all other work at the Gertie has been experimental. The next step will be erection of a modern plant. Having proved the extent and value of the orebody and demonstrated the adaptability of the machinery and treatment, the Gertie mine will be the first Black Hills mine to produce metallic tin on a commercial scale.

WASHINGTON.

CHELAN COUNTY.

(Special Correspondence).—N. G. Blalock has filed a claim on Lake Chelan for a storage reservoir, and on 3,500 cu. ft. of the flow on the Chelan river. He has been interested in mines in the Chelan country for several years and is said to have recently associated Jay P. Graves, of Spokane, with him in the Holden mine. It is believed that Mr. Blalock and Mr. Graves contemplate building an electric railway from Lake Chelan to Spokane, the Chelan River falls to be used to generate electric power for it and the mines. Mr. Blalock is reported to have said that $3,500,000 will be expended on mine and power development.

Spokane, June 14.

FERRY COUNTY.

(Special Correspondence).—The Palmer Mountain Tunnel & Power Co. has placed the contract for a 300-ton stamp and cyaniding mill with the Denver Engineering Co. The Palmer Mountain tunnel has intersected 24 veins, the ore from which will be treated by the cyanide process. Electric drills are to be used, each drill to be run by a separate electrically driven compressor. Men have been started at work on the foundation for the mill. As soon as the first three drills are received, work will be resumed in the adit, and on some of the veins crossed by it. Power for both adit and mill will be supplied from the company's power-house on Toats Coule creek.—Work is going ahead in the lower adit of the Pinnacle group, on Palmer mountain, and the force is to be increased.—— The inclined shaft on the Copper World is down 50 ft. and has cut into a body of shipping ore. Native copper is reported in some of it.—— Some new equipment has been ordered, and when it arrives another drill will be started at the Copper World Extension mine. Good progress is being made in sinking the shaft on this property below the 200-ft. level.—— Capital subscribed at Spokane is to develop the Horn Silver mine, in which good ore was found some years ago.

Loomis, June 12.

(Special Correspondence.)—J. J. Browne, of Spokane, has returned from a trip into Okanogan county, and reports greater activity in that section than ever before in its history. He says, at Oroville they show fine specimens of molybdenite from a new discovery 12 miles above that place, in the direction of Conconnully, on Pine creek. They had been working on it 10 days. At first they had 10 in., but the vein has broadened to three or four feet and the miners have 100 sacks ready for shipment.—— John J. Cole, of Findlay, O., Mr. Barr of Boston, and other capitalists, have been in that country looking into the property of the Copper World Extension, planning to put money into its development.—— A body of high-grade ore has been encountered in the shaft of the Copper World at a depth of 50 ft.—— On the foot-wall is a sheet of native copper. The ore is mostly bornite. J. L. Drumheller, of Spokane, has a seven months' option on the Benvenue, three miles north of Myers Falls. It is a gold proposition.

Spokane, June 14.

STEVENS COUNTY.

(Special Correspondence).—A rich blind vein of silver-lead ore was recently found in the Metalline mine while driving an adit. Since the first vein in the tunnel was encountered, another four feet in width was crossed, the ore running 20% lead and also carrying silver. A steam-drill is in use and the adit is advancing three feet per day. Drifts are being cut on both veins. Over a carload of ore has been extracted in the course of development.—— The Silver-Lead Mining & Smelting Co., in Metalline district, has put up buildings for mess and bunkhouses and has started work in the mine; transportation up the Pend d'Oreille river has been made a possibility, and a boat is being built. Boats are now running from Newport to Box canyon, and the Government has lately completed a wagon road around the canyon, which follows the river and connects with private roads to the mines.

—— Nearly a month ago, a new vein was encountered in a cross-cut from the bottom of the shaft in the Lucky Bill mine, four miles northeast of Newport. This vein is four feet wide at the face. The ore averages $7 gold and $7 silver and copper. Three parallel veins, discovered at the surface, will be crossed by the adit.—— Some years ago work was done on the Bonanza mine at Bossburg, and the machinery was afterward removed to another property. Work was lately resumed at the Bonanza under Canadian management, and new machinery is being installed. The Bonanza ore is low grade, but it is thought the mine will yield 1,000 tons per month, which will pay a profit.

Republic, June 12.

CANADA.

ONTARIO.

Plans and estimates for converting the Temiskaming railway, from North Bay to Englehart, to an electric road, are being considered by the Ontario government. The distance is 137 miles, and the cost is placed at $1,000,000. This will cheapen transportation to and from the Cobalt mines.

BRITISH COLUMBIA.

The Tyee Copper Co. (Ltd.), at Duncans Station, Vancouver Island, reports smelter returns for May as follows: Smelter ran 13 days and treated 1,915 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $38,177.

The British Columbia Copper Co.'s smelter has been blown out for enlargement. The Granby smelter received nearly 3,000 tons more ore than during the previous week, making a total increase of that much over last week's Boundary ore shipments. The shipments for the week ending June 9 were: To Granby smelter from Granby mines, 18,339 tons; from Skylark, 25 tons. To British Columbia Copper Co.'s smelter from Brooklyn-Stemwinder, 2,145 tons; from Rawhide, 627 tons; from Sunset, 825 tons; from Mountain Rose, 33 tons. To Trail smelter from Providence, 40 tons. Total shipments for week, 24,339 tons; total for the year to date, 555,312 tons. Smelter treatment for the week was: Granby smelter, 17,225 tons; British Columbia Copper Co. smelter, 1,338 tons; Dominion Copper Co. smelter, 3,630 tons; total for week, 22,693 tons; total for year to date, 567,101 tons.

Following were the ore shipments from Boundary mines for the week ending June 16: Boundary mines, at Phoenix, 18,976; Brooklyn-Stemwinder of Dominion Copper Co., at Phoenix, 3,333; Rawhide, at Phoenix, 330; Sunset, at Deadwood, 990; Mountain Rose, 60; Emma, at Summit, 454; Providence, at Providence, 30; total, 24,173. Ore was treated at the smelters during the week as follows: Granby Co., 17,153; Dominion Copper Co., 4,683. Total, 21,836. Total for year, 588,937 tons.——J. J. Martin of Phoenix has bonded 700 acres of mineral and comprising more than 20 claims at Phoenix, to New York and Spokane people. Extensive prospecting and development are to be systematically carried on.

(Special Correspondence.)—The Maple Leaf group near Grand Forks has been bonded for $60,000.—— The Hall mines smelter at Nelson is finishing additions which will cost $75,000 and includes the adoption of the Huntington-Heberlein process and the erection of a complete mill.—— Boston capitalists have taken a bond for $100,000 on the Big Copper mine, near Phoenix, and will put a large force at work.

Phoenix, June 8.

MEXICO.

DURANGO.

(Special Correspondence).—The new 1,000-ton smelter of the Valardena Mining & Smelting Co. is rapidly nearing completion and the old mines are being put in condition to supply ore to this plant. The concentrator of 200-tons capacity is running.

Valardena, June 15.

JALISCO.

The National Metal Co., operating in the Etzatlan district, is said to have completed arrangements for the establishment of an ore-buying branch in Etzatlan and quarters have been secured not far from the Mexican Central station. The new branch will be in charge of Ernest Honigman, who has been connected with mining enterprises in Mexico for several years. E. S. Dewey, manager of the National Metal Co., at Guadalajara, is connected with the establishment of the new branch. The rapid development of the Etzatlan and Hostotipaquillo mining districts is responsible for this move on the part of the National Metal Company.

A company is being formed at Guadalajara to work the Virgin de Guadalupe placer in the Tapalpa district. It will be known as the Compania Minera Internacional. The Virgin de Guadalupe was sold last December by Alberto Palos, who denounced it, to Silviano Camberos and Jesus Martinez.

Books Reviewed.

Report on the Operation of the Coal Testing Plant of the United States Geological Survey at the Louisiana Purchase Exposition, St. Louis, Mo., 1904, Edward W. Parker, Joseph A. Holmes, Marius R. Campbell, Committee in Charge. Part I, Introduction, by Edward W. Parker; Field Work, Classification of Coals, by Marius R. Campbell; Work of the Chemical Laboratory, by N. W. Lord, pp. 300, map and ill. Part II, Boiler Tests, by L. P. Breckenridge, pp. 681, ill. Part III, Producer Gas Tests, by Robt. H. Fernald; Coking Tests, by Fred W. Stammler; Melting Tests with Cokes, by Dr. Richard Moldenke; Briquetting Tests, by Joseph Hyde Pratt; Washing Tests, by John D. Wick, pp. 493.

This bulky report gives in much detail an account of the equipment of the coal-testing plant at St. Louis, the methods employed and the precautions taken to ensure accuracy in the data obtained. A preliminary statement of the more striking features of the work was published by the Survey a year ago as Bulletin No. 261, but a careful perusal of these three volumes will well repay anyone who read that bulletin.

When, early in 1904, the plans of the projected coal-testing plant at the World's Fair were published and attention was called to what the plant could do for the American coal trade, the writer took occasion to point out elsewhere that the results obtained might have far less scientific and commercial value than the promoters of the proposed trials anticipated. He based his views on these facts: To be of any permanent scientific value, not only would the tests have to be conducted with greater thoroughness than seemed possible at a plant dependent for its equipment on the generosity of exhibitors at the Fair, but also the coals would have to represent the average output of the mines whence they came; unless there were checks by mine sampling and the inspection of coal at the tipple, some operators on the lookout for a little inexpensive advertising would ship coal to the testing plant that was a long way from being a sample of their regular output. And if the systematic sampling of a selected mine in every important coal-producing center were possible, the tonnage forwarded would be utterly beyond the capacity of the plant. Hence there was a danger that if the coals tested fairly represented the mines from which they came, the mines selected would not represent the important fields. Moreover, so far as foreign trade was concerned, the tests proposed would be of comparatively little importance since, valuable as analyses and proofs of efficiency might be for advertising purposes, other factors ruled the export trade, the chief of these being ocean freight rates and the condition and composition of the coal that the foreign consumer receives. Happily, as the event has proved, any doubts as to the permanent value of the work undertaken were not justified.

Messrs. Holmes, Parker, and Campbell, the committee in charge, found out long before the plant was completed that more coal would be offered for testing than could be handled. They also clearly perceived the importance of careful and frequent checks and the necessity of sampling the seam whence each coal was mined; and finally they recognized that the results would be of most value if attention was concentrated on the needs of the home consumer. As a result they did not attempt too much with the equipment provided, and let the export trade look out for itself. Their choice of mines was largely, no doubt, governed by the location of the plant. Hence small mines in States that rank low as producers received attention not given the great mines of Pennsylvania, Illinois, and Ohio, but four mines in these three States being sampled for the various tests and but six carload lots of coal being received from them, though the States rank first, second, and fourth as producers and their combined output in 1904 was 232,018,848 tons.

Whatever causes governed the selection of mines, the actual result has been most happy. For had the mines been chosen with regard to present size and value of output, three or four States would have monopolized the plant and the tests would have given results far less reliable and suggestive. In fact, it is not too much to say that as a result of the committee's care, forethought, and good judgment, their report is a unique addition to the literature of coal.

So far as the writer is aware, no nation has ever undertaken to analyze under standardized conditions and compare in so many ways such a variety of coals. The German Government has a testing laboratory just outside Berlin that covers a wide field of work, and the Belgian Government, at Framieres, has what is probably the finest coal-mining experiment station in the world,

but at neither of these places has any work been done that is in the same class with that done at the plant at St. Louis. As for Great Britain, until 1899 the leading coal-producing country of the world, practically all that has been undertaken there has been carried through by firms or by individuals with the exception of occasional steaming tests under the supervision of the Admiralty. One can find in the voluminous report of the Royal Commission information on every phase of the occurrence, mining, transportation, and use of coal, and that report, the final volume of which is yet to appear, will always be a storehouse of information to anyone interested in the coal industry of the United Kingdom and of the world. Yet valuable as is that work, it is doubtful if any such compilation of miscellaneous evidence can give the direct benefits of an investigation of narrower scope, undertaken on a scientific basis, which shows by direct comparison under standardized conditions the relative values of different coals and emphasizes the importance of new developments in the utilization of their energy.

One fact that will gain for the work at St. Louis favorable recognition is the timeliness of the undertaking. Had the Government carried through a much more comprehensive series of tests twenty years ago, when the word inexhaustible was freely applied to all fuel supplies, and when coal was generally sold on the strength of trade names, the results would have been of less immediate utility because consumers would not have been prepared to follow out suggestions looking to the conservation of our fuel resources. As an instance of the change in public opinion may be cited the utter indifference of State legislatures to the ruthless waste of natural gas in Ohio, Indiana, and Pennsylvania during the late '80s, when millions upon millions of cubic feet were allowed to burn in huge flambeaux for no better purpose than to promote the sale of house lots in boom towns. The geologist who foresaw and foretold the inevitable exhaustion of the underground reservoirs found his warnings fell on deaf ears. Today in most States producing natural gas, there are adequate laws for preventing waste, and the enforcement of these laws meets public approval. If a great gasser in Indian Territory roars away beyond control for a week or two, the energy wasted is commented on by the press.

As another instance of the present attitude toward fuel losses may be cited the central power stations being erected in the Pennsylvania anthracite districts, and in the bituminous fields of that State and of West Virginia. Water-tube boilers, grates for burning small coal, fuel economizers, careful insulation of steam mains all show that even at the mines coal is not to be wasted. In fact, practically all the trusts that figure so largely in the current discussion of tendencies in production and distribution are setting an example in small economies, the conservation of what has been thrown away, that lesser corporations must follow. Hence it is absolutely certain that the endeavor to utilize to the utmost sources of energy and raw materials will be a more and more prominent factor in the industrial life of this nation. Therefore such work as that conducted under the supervision of Messrs. Parker, Holmes, and Campbell, calling attention to the immense gains possible in the utilization of the stored energy of our coal fields has a peculiar worth not only in the actual possibilities shown, but in indicating to a public ready to make the most of these possibilities the importance of further work along the same lines and the high value of similar research in other branches of production.

SAMUEL SANFORD.

Washington, May 1906.

The ore movement at Duluth, Minn., this year is tremendous and gaining in volume and speed weekly. It has always been the fear that the two Minnesota roads owned by the United States Steel Corporation would operate to the advantage of that company and sidetrack or delay, when convenient, outside and independent shippers. That this is not the case is a matter that is now causing much favorable comment. In the case of the Duluth, Missabe & Northern there might be more excuse for such action than with others, so enormous is the tonnage it is handling for its owner in the short season—10,000,000 tons—and so vast is its expectation of total business. Eleven million tons of ore moved in a single season by one road is a total large enough to stagger the imagination.—From 'Iron Age.'

Additional Mining Summary.

NEVADA.

LINCOLN COUNTY.

Affairs at the mines of the Bamberger-De Lamar Co., at De Lamar, are gradually assuming their former condition. Connection with the vein, opened some time ago on No. 6 level, has been since made with it at the three, five and seven. A cross-cut on the former shows 40 ft. of ore, the average value of which is better than any that has been milled under the present administration.——The lease on the Magnolia group operated by Harry Lowry, is proving satisfactory, and while the tonnage of ore sent to the Salt Lake furnaces is not large, it is affording an average of nearly $200 per ton gold and silver. Meanwhile, the lessee is opening up a considerable tonnage of ore that will be reduced at the mill by the company, the lessee being permitted to appropriate the shipping ore only under the terms of his franchise.

NYE COUNTY.

A copper find has been made in Jackson Mountain district by N. B. Robinson who, aided by Goldfield people, will open up the vein which is 75 ft. across. The property was located a year ago by Robinson, but the copper discovery was only made a few days since.

(Special Correspondence).—Times in this camp are improving rapidly. Since the Las Vegas & Tonopah railroad has advanced its office to Johnnie siding, Indian Springs is a thing of the past. At the new station teams are on all sides clamoring for room to load freight for Bullfrog, Johnnie and other points. The newsboy, on the arrival of trains, is the latest feature. Stage fare to Beatty is $14, distance 45 miles up the Armagosa desert. The track-laying outfit is 15 miles out, laying steel at the rate of two miles daily. Mines and prospects are being transferred, some for cash, others on option. Fred Boller, a lessee, who made a strike on one of the claims of the Johnnie Consolidated group, four weeks ago, yesterday opened up another vein 30 in. wide and parallel to his first find and 30 ft. to the east. He is taking out ore showing much coarse gold. It creates no excitement. These 'Chuckawallas' simply look wise and say, "I told you so."——McClanahan, Moser & Smith have bonded to Mr. Filsley, for 45 days, two prospects for $3,000. Assays run from $18 to $114 per ton, with a 5 to 18-ft. vein. Since the automobile and daily stage-line commenced running between here and Johnnie siding, strangers are coming in from all directions. It is reported that a 40-stamp mill is coming from the east (Denver, I think), and a cyanide plant is part of the outfit. The Thomas Co. is arranging to put a mill on its property. As many as 30 mines and prospects have changed hands here inside the past 60 days, and all at good figures. I have just heard of a contract being signed for building a two-story hotel and four concrete private dwellings.——Fred Boller and Wm. Waters are just in from the new strike on the Johnnie Consolidated. They bring samples of 31 sacks of ore which they believe to be worth $20,000 per ton. They broke into this streak after six o'clock last night and worked all night sacking the ton and a half. They have 12 in. of this ore on the foot-wall and 18 in. of $1,000 ore, which they followed down from the surface.

Johnnie, June 18.

WASHOE COUNTY.

C. L. Dignowity is reported to have bought the Reno-Mizpah mines in Peavine district, northwest of Reno. These mines are in active operation.

WHITE PINE COUNTY.

Samuel Newhouse is reported to have offered $50,000 for a mining claim at Cherry creek. It is owned by Blain Grey and family and has been held by the Greys for 40 years.

The New Zealand government is asking for bids for piercing a tunnel over five and one-quarter miles long, much longer than any railroad tunnel in the Southern hemisphere. The tunnel is to be bored through the main central range of mountains of the Middle island at Arthur's pass. It will pass under the coach road through Otiria gorge, a well known scenic gorge. The tunnel will form part of a railroad now under construction connecting the east and west coast districts of the Middle island. The lowest passes in the dividing range are 3,000 ft. high. The ascent from the western side is steep, through a difficult country for railroad building. The road has been completed and opened for traffic to a point about two miles from the western end of the tunnel. It is proposed to operate the tunnel section of the road, when completed, by electricity generated by power obtained from the Otira river.—From 'The American Manufacturer.'

Personals.

Percy L. Fearn is at Butte.

J. H. Curle writes from Seoul, Korea.

B. B. Thayer has returned from Butte to New York.

Chester F. Lee, of Seattle, visited San Francisco this week.

Frank McLaughlin of Santa Cruz, is visiting San Francisco.

Eugene Braden has gone on a short visit to Helena, Montana.

E. C. Musgrave is now living at Victoria, British Columbia.

Frederic J. Siebert starts this week for Glasgow, Scotland.

H. L. Slosson, of San Francisco, has gone to Virginia City, Nevada.

Olof Wenstrom has returned to Boston, after a lengthy stay in Mexico.

John Dern is president of the newly organized Bingham Mines Co., at Bingham.

R. M. Atwood, of Helena, is general manager of the new Cliff Mining Co., at Ophir, Utah.

Ernest H. Simonds has returned to Berkeley from an examination near Austin, Nevada.

H. M. Sweet, secretary of the Bingham Consolidated mines, has been on a visit to Salt Lake City.

Everard Arnold, on his return from sampling a Fresno copper mine, has gone to Grass Valley.

M. A. Daugherty, of Salt Lake City, is manager of the Carbonate Hill Mining Co., in Morgan county, Utah.

Walter Van Matre is superintendent of the Washington mine at French Gulch, Shasta county, California.

James Douglas delivered an address before the science members of the graduating class of Columbia University.

S. Herbert Williams, of Boston, consulting engineer to the Shawmut Mining Co. at Bingham, has been in Utah on an inspection trip.

Frank Brown, of Lewiston, Idaho, formerly manager of the Jumbo mine at Buffalo Hump, leaves for Nome, Alaska, to develop a bismuth vein.

Charles F. Porter, of Salt Lake City, has been made a director and purchasing agent for the Nevada Gold Mines Co., operating in Lincoln county, Nevada.

Arthur W. Stevens, of Chicago, has just returned from making extensive examinations of properties in Wisconsin, and leaves at once for Idaho to examine several large placer properties for Chicago capitalists.

J. B. Higgins, senior mine captain of the Simmer & Jack mine, at Johannesburg, is visiting New York. He is on his way to his former home at Reno, Nevada, and returns to his duties within six months, traveling through Japan and India.

J. V. N. Dorr, manager of the cyanide mill, of Lundberg, Dorr & Wilson, Terry, S. D., was in Denver last week in the interests of the Horseshoe Mining Co., for which company he is consulting engineer in the reconstruction of their cyanide mill at Pluma, South Dakota.

H. Kenyon Burch, who has been with the Detroit Copper Mining Co., of Arizona, for the past three years, and recently constructed the new 1,200-ton concentrator for the above company at Morenci, Ariz., has resigned his position and will leave in a few days for an extended trip north and west, to inspect the different concentrators and power-plants. Then he will go with the Montezuma Copper Co., of Nacozari, Mexico, as chief engineer in charge of construction and will build a new mill for this company of about the same capacity, and on the same lines as the mill at Morenci.

Obituary.

William A. Akers died at Los Angeles on June 17 by reason of injuries received in an automobile accident the night previous. He was a mining engineer of established reputation, having filled many important positions. At one time he was manager of the Combination Mining & Milling Company, at Hope, Montana, and afterward he was with the Colorado Mining & Smelting Company at Butte. Then he became manager of the Sheridan-Mendota mines at Telluride and in 1895 he had charge of the Golden Fleece mine, when it was in bonanza. Later he opened an office as consulting engineer at Salt Lake City. Recently he was under retainer from the Amalgamated Copper Company, having an office first at Hermosillo, in Mexico, and then El Paso,

Texas. He moved to Los Angeles in January of the current year. In March he visited San Francisco. Akers was regarded as an especially well-informed engineer; he was an expert witness in many important mining cases, such as the Bell-Speculator, the Mammoth-Grand Central, and the Heinze-Amalgamated litigation. He was a man of particular courtesy of manner, which, with other sterling qualities, made him many friends. His sudden death will bring a cloud to many of those that go down in mines. It remains but to add that he was about 46 years of age and leaves a wife, formerly Miss Stanley of Butte.

Trade Treatises.

The Ingersoll-Rand Co. have issued Bulletin No. 2,007, on their Imperial piston-drill, an indispensable tool in the machine shop and mill. These machines and all their working parts are fully described and illustrated. Their catalogue, D 43, is a handsomely illustrated treatise on machine rock-drills, showing their varied application under many conditions. Catalogue X 136 describes and illustrates the Imperial, Type 11, air-compressors made by the Ingersoll-Rand Co., of 11 Broadway, New York.

Commercial Paragraphs.

One of the largest establishments for the reduction and sampling of ore in Nevada is now nearing completion at Tonopah, for the Tonopah Sampling & Ore Purchasing Co. The methods employed for handling large quantities of ore utilize the most approved modern appliances. The main building is provided with eight storage and two receiving bins, each with a capacity of 100 tons. These are connected with three bucket-elevators used in conveying ore to the top story, whence it descends by gravity through the various chambers and grinders and is distributed finally through chutes to proper receptacles, ready for the assayer. Every operation is performed automatically. The plant will be electrically operated. A transformer house has been erected adjacent to the main building in which three transformers are installed. Eighty-five tons of ore will be treated daily when the plant is in regular operation This output can be readily increased by the addition of equipment. The entire plant is being furnished by the Allis-Chalmers Co. of Milwaukee.

The Colorado Iron Works Co., of Denver, reports constant shipments of ore received to be treated at its testing plant. These shipments vary from 25 lb. to one or more carloads. A recent 500-lb. shipment came from Japan; others have come from Mexico, the Philippines, Australia, and South America, as well as from points all over the western half of North America. The company's testing facilities include stamp-milling, amalgamation, concentration, cyanidation, with all the modern accessories for each process.

Crocker-Wheeler Co., of Ampere, N. J., has received an order from Columbia University, New York, for one 450-kw. 250-volt direct-current generator for lighting and power for the University.

Tourmaline and Topaz in California.—The southern counties of California bid fair to rival the Ural mountains in the production of tourmaline, beryl, topaz, and the other precious stones which have been the pride of that region for the last half century. The Pala region in San Diego county has become especially noted in gem production, and George F. Kunz of the United States Geological Survey, calls attention in his forthcoming report on the production of precious stones in 1905 to the fact that a number of adjacent localities give indication of yielding the same minerals.

Latest Market Reports.

Anglo-American Shares.
Cabled from London.

	June 14. £ s d	June 21 £ s d
Camp Bird	1 4 0	1 5 9
El Oro	1 5 7½	1 6 3
Esperanza	3 17 6	3 18 3
Dolores	1 17 4½	2 1 3
Oroville Dredging	0 18 6	0 18 0
Stratton's Independence	0 4 6	0 4 6
Tomboy	1 5 7½	1 5 0

(By courtesy of W. P. Bonbright & Co., New York.)

METAL PRICES.
By wire from New York.

	Average Prices for Week Ending June 14.	June 21.
Lake	$18.62@$18.87	$18.62@$18.80
Electrolytic	18.37@ 18.62	18.37@ 18.55
Casting	18.12@ 18.25	18.12@ 18.25
Lead	5.75	5.75
Spelter	6.13	6.18
Silver	0.64¾	0.65½

The authorities of Birmingham university have recently opened on the university grounds an experimental coal mine, occupying nearly an acre of ground. The purpose is to give practical instruction to students in all the problems and operations of coal mining. They are exercised in underground surveying, the connection of surface with underground surveys, the testing of ventilation, the measurement of air volumes and velocities, the friction of air currents, the various methods of breaking coal, and the management of different kinds of drills and cutting machines. The completion of this artificial mine has been awaited with interest, and it is expected to prove very valuable in teaching the science of mining.—From 'The American Manufacturer.'

Natural Soda in Mexico.—Under the blazing sun of the desert, surrounded by barren and bleak sand dunes, lie lakes of crystals of carbonate of soda, to all appearances great masses of snow and ice, but in reality a substance from which can be made both soap and glass. At only one other place in the world is natural soda found under conditions which admit of industrial development, and at that place it must be shipped several hundred miles by rail, and many tons of water must be evaporated by coal to obtain a ton of the product. The Mexican lakes are within 3,000 yd. of the sea and the fierce sun and heat of the desert attend to the evaporation. The world's consumption is very large, and at present nearly all of it is manufactured from common salt with the use of expensive machinery. At Adair bay, when the temperature is right, the water of the lake crystallizes into pure carbonate of soda, nature doing what man requires machinery and coal to do. The Mexican Government declines to dispose of these lakes to anyone, President Diaz believing that they may become sources of income to the country, just as the nitrate of soda beds are to Chile. What it may mean to the soap and glass industry of Mexico may be judged when it is stated that at present manufactured soda, one of the principal items of cost, sells for $75 per ton in port, while the same article from Adair bay may be delivered for less than one-third of that price.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 10 Bacon Block, Oakland, has official reports of the following United States patents issued to Pacific Coast inventors:

Patents Issued June 12, 1906

823,458.—**Fountain Paint-Brush.**—C. H. Abbott, Whittier, Cal.

822,912.—**Concentrator.**—M. P. Boss, San Francisco, Cal.

822,913.—**Crushing Mill.**—M. P. Boss, San Francisco, Cal.

822,914.—**Motor for Stamp-Mills.**—M. P. Boss, San Francisco, Cal.

823,391.—**Apparatus for Applying Liquids to Covers of Receptacles.**—W. C. Buhles, San Francisco, Cal.

823,204.—**Glove.**—R. N. Carson, San Francisco, Cal.

823,263.—**Briquet Press.**—J. J. Crawford, Oakland, Cal.

823,040.—**Automatic Safety Trolley-Pole.**—J. R. French, Los Angeles, Cal.

822,940.—**Apparatus for Recovering Precious Metals.**—E. J. Garvin, Portland, Ore.

823,406.—**Rule Marker.**—J. L. Gastineau, Alhambra, Cal.

823,213.—**Combined Hook and Box.**—E. E. Gibson, San Francisco, Cal.

823,167.—**Dental Disk Shield.**—W. F. Green, Modesto, Cal.

822,950.—**Water Service.**—W. C. James, Los Angeles, Cal.

823,045.—**Folding Bed.**—W. C. James, Los Angeles, Cal.

823,174.—**Lock.**—J. Jorgenson, San Francisco, Cal.

823,221.—**Lock.**—J. Jorgenson, San Francisco, Cal.

823,222.—**Lock.**—J. Jorgenson, San Francisco, Cal.

823,337.—**Weeder.**—J. H. Lamdry, Moro, Ore.

823,282.—**Head and Filler for Liquid Receptacles.**—D. Landau, San Francisco, Cal.

823,059.—**Rock Drill.**—E. Leichter, Nevada City, Cal.

823,341.—**Mechanical Movement.**—F. N. Livingston, Ballard, Wash.

823,182.—**Incubator.**—O. W. Lutz, Petaluma, Cal.

822,967.—**Gripper for Printing Presses.**—F. I. Macauley, Alameda, Cal.

823,060.—**Fluid-Pressure Motor.**—Magney & Masterman, Los Angeles, Cal.

822,969.—**Badge and Watch Guard.**—Martin & Stockton, Snohomish, Wash.

823,138.—**Cheese Cutter.**—A. B. Roach, Los Angeles, Cal.

823,443.—**Hinge.**—F. Sandham, Los Angeles, Cal.

823,296.—**Detachable Calk Horseshoe.**—W. E. Shaw, San Francisco, Cal.

823,451.—**Joint.**—Sweeny & Sylva.—Los Angeles, Cal.

823,007.—**Hop-scoop.**—Charles True, Sherwood, Ore.

823,090.—**Phone Transmitter Attachment.**—R. A. Walton, Los Angeles, Cal.

823,091.—**Phone Switching Apparatus.**—R. A. Walton, Los Angeles, Cal.

823,092.—**Phone Transmitter Attachment.**—R. A. Walton, Los Angeles, Cal.

823,147.—**Railway Switch.**—E. Wartman, South Bend, Wash.

823,014.—**Cigar Protector.**—F. H. Whomes, Los Angeles, Cal.

38,077.—**(Design) Wall Pocket.**—C. A. Flanagan, Union, Ore.

822,403.—**Bicycle Seat Spring.**—Sweeney & Mayes, Orosi, Cal.

822,788.—**Protector for Horses' Tails.**—Tuthill & Boyd, Portland, Ore.

822,707.—**Automatic Dancing Figure.**—H. Wolke, San Francisco, Cal.

822,783.—**Course Finder.**—J. F. Smith, Everett, Wash.

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DIVIDEND NOTICE.

CALIFORNIA SAFE DEPOSIT AND TRUST CO., Cor. California and Montgomery Sts., San Francisco. For the six months ending June 30, 1906, dividends have been declared on the deposits in the savings department of this company as follows: On term deposits at the rate of 3 6-10 per cent per annum and on ordinary deposits at the rate of 3½ per cent per annum, free of taxes, and payable on and after Monday, July 2, 1906.

J. DALZELL BROWN, Manager.

DIVIDEND NOTICE.

SAN FRANCISCO SAVINGS UNION, NW. Cor. California and Montgomery Sts., San Francisco. For the half year ending 30th June, 1906, a dividend has been declared at the rates per annum of three and two-thirds (3 2-3) per cent on term deposits, and three and one-third (3 1-3) per cent on ordinary deposits, free of taxes, payable on and after Monday, July 2nd, 1906. Depositors are entitled to draw their dividends at any time during the succeeding half year. Dividend not drawn will be added to the deposit account, become a part thereof and earn dividend from July 1st.

LOVELL WHITE, Cashier.

DIVIDEND NOTICE.

GERMAN SAVINGS AND LOAN SOCIETY, 526 California St., San Francisco. For the half year ending June 30, 1906, a dividend has been declared at the rate of three and six-tenths (3 6-10) per cent per annum on all deposits, free of taxes, payable on and after Monday, July 2, 1906. Dividends not called for are added to and bear the same rate of interest as the principal from July 1, 1906.

GEORGE TOURNY, Secretary.

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EDITORIAL.

THE OUTPUT OF GOLD from the Rand during the month of May was 461,202 fine ounces, equivalent to $9,500,000. This is the highest production on record, being 20,000 ounces ahead of March, the previous maximum.

A CONTEMPORARY, waxing enthusiastic over the dredging operations in its vicinity, says that "the dredger in Yreka creek, at night, with its bright electric lights burning, and the clashing of its machinery, seems like a Mississippi river steamer, plowing along in the water, although remaining stationary." It must be "the ship" the hopeful ever expect, but that so rarely "comes in," even to those who invest in a form of enterprise as substantial as dredging.

COMPLAINTS come from the smaller mining camps of British Columbia that there is a shortage of labor. This is due in part to the requirements of the bigger mining centres, such as the Boundary district and Rossland, but the scarcity of miners is also attributable to the large number of men who are engaged in prospecting throughout British Columbia; which promises well for the future of the region. It is to be hoped that the active explorations now going on will prove rich in mineral discoveries.

CANDLESTICKS of the old-fashioned kind, made of solid silver, such as one finds in the old churches of Mexico, have doubtless been used on occasion as weapons of offense during revolutionary times; on the other hand, the miner's candlestick, made usually by a blacksmith proud of his skill, has been regarded as a convenience not only for holding the feeble dip that illuminates the miner's travels underground, but as a serviceable tool for prying out bits of vein-rock. The spear-like point intended to be stuck into the timber, to hold the light while the owner is taking notes or handling ore, has been made longer so as to permit of use as a small pick, in breaking a hand sample. But even a tool designed for good service can be perverted to base uses, and we learn that, at Bingham, Utah, a miner stabbed his shiftboss with his candlestick, inflicting what may prove a mortal wound. Thus does the candlestick become a stiletto.

IT APPEARS that the Arbitration Court established in Western Australia for the purpose of industrial conciliation has failed. At the annual meeting of the Chamber of Mines, Mr. Richard Hamilton, the president, said that "the application of the principle of compulsory arbitration to the settlement of industrial disputes has to be pronounced a failure, and the Act is in great danger of becoming a dead letter. Neither side has any faith in the Arbitration Court and both sides evince a desire to shun it as far as possible." Although the awards of the Court in important cases have been generally favorable to the employers, this has not helped them, for when they attempted to put the terms into effect, the laborers have simply refused to work under the conditions laid down and defied the decision of the Court. Even when the employers have declined to take full advantage of a favorable award—a sure sign of weakness somewhere—they have been unable to prevent a strike and subsequent embarrassment. Thus this method of avoiding labor troubles is a fiasco. It was the expression of class legislation, having been brought forward by the Labor party, the followers of which, evidently, broke faith, in refusing to accept the Court's decisions as soon as they found them to be adverse. It is a pity; for the method seemed, on the face of it, a good one. The result proves once more that no legislation can make men honorable and that the best preventative of trouble between employer and employee is fair dealing.

IT IS REPORTED from southern California that Mexican laborers engaged in laying track have refused to work, because of the intense heat, the steel rails actually blistering their calloused hands. No complaint was made as to wages, but the men declared they would not continue work during the heated term, at any price. During construction of the Southern Pacific Railroad in the vicinity of Yuma, in the early '80s, most of the rails were laid at night, when the temperature was a few degrees cooler than during the day. In summer in some portions of the desert region, the rocks became too hot to touch or to walk upon, and it is not uncommon for them to retain this high temperature, from 110° to 130°, throughout the night.

VALUES is a term in constant use, as a substitute for the metals. People extract 'values' out of an ore, they precipitate the 'values' in the zinc-box and they collect the 'values' by concentration. It is a bad usage and is indicative of slovenly writing. One does not precipitate or extract or collect the values any more than does these things to an arithmetic mean or a geometric ratio. The *value* of an ore signifies the amount of money represented by the metals contained in it as determined by assay; for assay-value is usually understood, any other value being too variable to signify anything intelligible. Why not say the *metals* when you mean metals? Of course the term to which we are making objection means the valuable metal or metals in an ore; well then, why not precipitate or extract or collect the gold, or the silver, or both precious metals, or the lead and copper? Why use these hazy terms and deal in such generalities when there is no need for it, save the tyranny of a bad custom? It may seem a small matter, but careful writing tends to clear thinking.

THE GEOLOGICAL SURVEY has encountered difficulties in obtaining the usual appropriation from Congress, the voting for that purpose having been preceded by some vigorous criticism. We are glad to note that no attempt was made to cut down the appropriation for geology, but the wood, water and arithmetic divisions received severe treatment, the result being that the money for hydrography was cut in two. It is pleasing to note that the members of Congress show little disposition to criticize the geological work of the Survey, although there is decided questioning as to the advisability of attempting so much work only thinly connected with geology. There is a probability that the reclamation service will be detached from the Survey permanently and if the hydrographic department is kept under restraint, we shall get back to conditions more favorable to the mining industry, that is, the real geological work will regain its proper relative importance.

THE PROBLEM of handling the vast tonnage of tailing discharged from the copper mills of Lake Superior has assumed such proportions in recent years that much ingenuity has been required in devising methods for disposing of this waste material. The largest mill crushes 8,000 tons of ore daily, and when it is understood that each ton of sand is accompanied by about 30 times its weight of water, the volume and weight of tailing to be considered, will be appreciated. Tailing-wheels to elevate the sand have been built and operated at great expense; the material is taken from the lowest floor of the mill and elevated 40 to 60 feet and in this manner enough fall

is gained to allow the sand to be carried away in long launders by the current of water and discharged into the nearest available dump, either one of the small lakes in the vicinity, or Lake Superior itself. Recently a novel device has been proposed; it is to dewater the tailing by means of classifiers, the water flowing in a sluice to the lake, the sand being conveyed by endless belts the desired distance, the conveyor running on idlers on top of the flume. The sand is to be discharged into the water just at the end of the flume, so that it may be distributed into deep water, as at present. This idea, it is thought, will make it possible to dispose of the mill-waste on a much lower gradient than by methods heretofore employed, and at a less ultimate expense.

Preventable Frauds.

During the past week two American adventurers, posing as promoters, were convicted in London of criminal practices in connection with the sale of shares in the American Mining, Milling, Smelting and so forth Company. It appears that they sold stock at big prices and on statements that were never verified. We have seen some of the circulars they sent out and it seems to us that people who are misled by such stuff deserve to lose their money. We look at it in this way: If intelligent people—for the unintelligent there is no basis of argument—put money in mining ventures without any knowledge as to the promoters or of the mine being promoted, and if they take no steps to secure advice, then they are flouting the profession which exists to give such advice. Anybody in London, Paris or Timbuctoo can secure a copy of some respectable mining paper and from it they can get the name of a mining engineer living near the scene of operations; if then they will write to him, not failing to enclose such a small fee as they would pay a lawyer or a doctor, it is likely that they will get sufficient advice to save them from a blunder. It is not necessary to see a mine to detect an imposture based upon it. Furthermore, the majority of people who are deluded by such adventurers are within easy reach of professional men and it is easy to go to one of them, show him the prospectus and ask him if it has the ear-marks of sound business. A mere glance is often enough to detect a fraud, for those that concoct such schemes do not expect them to pass the criticism of experienced mining men; on the contrary they prepare them as lures for the unwary, the simple, and the greedy among policemen, housemaids, clerks, retired military and naval people, and penurious clergymen. Old England and New England both contribute annually a large sum of money in this way, not to the mining industry, but to the *chevaliers d'industrie*—the knights of the financial highway.

Too many people are deterred from seeking professional advice because they know of no middle course between engaging an engineer at a big fee and going it alone without any sort of advice; and this is so because it does not occur to them to treat a mining engineer as they would a doctor or a lawyer, going to him for a consultation that need occupy only a few minutes and that should entail only a small fee. We have reason to believe that many experienced men who do not care to go to the ends of the earth except for an adequate honorarium will tender office advice to those who approach them in a proper way. It is time mining were treated as something better than gambling and mining engineers as something more businesslike than a hybrid between a professor and a promoter.

On the Rand.

Conditions in South Africa continue to be such that it may be said that they must become worse before they can be better. The crisis is likely to come next year when the Transvaal obtains self-government and the people then in control decide whether to retain the Chinese in the country or to return them whence they came. Recently the British Government issued a proclamation giving the Chinese a chance to go home and offering them assistance in the expense of repatriation. However, we learn from our correspondent at Johannesburg that after the proclamation had been posted two weeks, it became evident that they had no desire to leave; so that only a few of the coolies are likely to be lost to the mines. The nature of the position on the Rand can be inferred from the fact that the mining companies, by means of a test case, appealed to the Supreme Court of the Transvaal to prevent the posting of the repatriation notices in the Chinese compounds, but failed to stop it.

The fortunes of the white population of Johannesburg being identified for the most part with the success of the mines, the feeling is naturally one of irritation against the Home Government. They think that the officials in London interfere too much in South African affairs and that the mining community is the victim of a misguided paternalism. They pray to be delivered from the curse of politics. They would like to be let alone, to indenture Chinamen, control the Kaffirs, or do anything else essential to the needs of the business of gold mining. The future of South Africa is no particular affair of theirs, as compared to the immediate prosperity of the Rand. Most of them expect to return to their own country—Germany, England, or America, as the case may be—and all they ask is the chance to make money enough during the years of exile in the Transvaal. To such men the far-reaching effect of a statesman's policy is a secondary affair, compared to any hindrance to the uninterrupted extraction of gold from the 'banket.' They do not care for Chinamen or for Kaffirs and would be willing to let them go, provided other sources of labor supply could be discovered, but no other being forthcoming they think it sloppy sentiment to talk of 'slavery' and misguided charity to take too great an interest in the happiness either of the Mongolian or of the African native. To them he is a pawn in the game, in which pawns are sacrificed to the larger pieces on the board.

Meanwhile, the gold production increases; it is now 9½ million dollars per month. Yet the share market is lifeless and quotations recede steadily, with an acute uneasiness due to expectation of a crash at any moment, when forced liquidation may prove too much for the big houses. The decision of the Liberal cabinet at London to prohibit further importation of the Chinese until the Transvaal gets responsible government, next March, will cause the Chinese employed at the mines to dwindle in number, by sickness, accident and repatriation. What will happen next March no one can foretell, for it is not known what attitude the Boers will assume. They are opposed to the mining industry, which was the immediate cause of Kruger's corrupt politics and of his eventual downfall. The mining magnates, whom they tried to hector, and the mining men, over whom they tyrannized, got their revenge when the war swept the whole Boer regime into the Indian Ocean. No wonder the Boers do not like the gold miners; but they are shrewd and know their own interest, so that it is unlikely they will paralyze the industry which alone can keep the country from insolvency.

By the Way.

The London 'Times,' referring recently to the oldest of scientific institutes, the Royal Society, said:

The Royal Society, like every other association of human beings, has from time to time to provide itself with a new chief magistrate. More fortunate than the larger society of which we are all members it does this at fixed periods and with dispassionate gravity and decorum. Yesterday witnessed one of these recurrent changes, when, at the anniversary meeting, Sir William Huggins surrendered the presidency of the society into the capable hands of Lord Rayleigh. The astronomer, whose labors have done so much to give English astronomical science the distinguished place it occupies in the astronomical opinion of the world, is succeeded by a physicist who, by the breadth and variety of his research, the profundity of his knowledge, and the skill with which he has carried on the interrogation of nature, will rank among the greatest of those who have promoted that increase of natural knowledge which is the fundamental object of the Royal Society. It is worth noting that both men belong to a class of scientific investigators which, if not an exclusively English product, has certainly found more numerous representatives in this country than in any other. That is the class of men who live for science, not by science—men whose means render them independent of exertion, whose position offers many temptations to inaction, and whose abilities, if turned to remunerative pursuits, would ensure rich rewards of the kind that satisfies vulgar ambition. To men of this class—men who, according to one definition of amateurs, would have to be called amateurs, but who lift the word high above all vulgar connotation and restore its etymological significance—English science owes a debt that is simply incalculable. In that class, already sufficiently illustrious, we must include men like Michael Faraday, denied by fortune the power to give of their wealth to the cause of science, but nobly content to live in the utmost simplicity upon a pittance less than the wages of a skilled artisan, while working out discoveries that have changed the face of the world. It would be an evil day for England were the succession of gifted enthusiasts to come to an end, not only because their work is of a higher and more vivifying kind than that of ordinary men, but also because we are, and apparently are likely for some time to remain, very far behind in the organization of professional science. We are also far behind in the general diffusion of elementary scientific ideas.

The catholicity of the Royal Society is displayed by the fact mentioned by Lord Rayleigh, that all the medals which can be given to foreigners have this year been awarded to men of science in other countries. Assuming, as we must, that this has not happened through any desire to favor foreigners unduly, the pleasure derived from contemplating the impartiality of the Royal Society must be tempered by the inevitable reflection that we can hardly be keeping pace at home with what is done abroad. Peculiar interest attaches in the circumstances of the moment to the presence among us of Professor Mendeleeff, whose brief leave of absence from official duties covers, we believe, no more than the time required to receive in person the Copley medal awarded to him by the Royal Society. Though his own distinction as a chemist and as a man besides of wide and varied practical ability is a sufficient reason for the award, he modestly and rightly treated it as being also a testimony of sympathy with his country in her present trials. Official good-will is properly expressed through the Russian ambassador, who sat at the side of the president, but the sympathy of intellectual England with intellectual Russia finds welcome expression in the honor decreed to Professor Mendeleeff.

Under conditions where a weir could not be built, a novel way of measuring the flow of an artesian well was devised. Forty feet of 10-inch pipe was screwed into a 90° elbow on the pipe where it came out of the ground, and a hand force-pump attached to a small hole tapped into this pipe. The force-pump drew a red aniline liquid from a pail and injected it into the stream, where it was carried along with the water and at the same rate. By means of a stop-watch and the known carrying capacity of the pipe the flow of the well was easily determined.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

The best grades of zinc ore mined in the Joplin, Missouri, and adjacent fields, contain 55 to 60% zinc.

Tern plates are the so-called tin plates, made by dipping thin sheet iron into a bath of molten tin.

In Nevada the state law has fixed $4 as the value of a day's work performed on unpatented mining claims.

It is an easy matter to feed too much coke to a blast-furnace. The almost inevitable result will be to cause the fire to run upward and chill the tuyere zone.

Since the advent of the electro-magnetic separator into metallurgy, many old waste dumps containing low-grade or mixed sulphide ore, have been profitably worked.

Heap-roasting of sulphide ore is less expensive than roasting in stalls or in furnaces, but the practice of heap-roasting is more destructive of vegetation than either of the latter.

The fact that an ore deposit is superficial—does not go down—is no indication of its poverty. Some shallow ore deposits are very rich, thus compensating for lack of depth or magnitude

When molybdenite is to be concentrated it is better to crush the ore with rolls than with stamps, as the latter have a tendency to create an abnormal amount of slime which the rolls avoid to some extent.

The Secretary of the Interior, in September 1899, decided that a patent may issue covering both quartz and placer claim, this decision reversing that previously made by United States Land Commissioner Best.

Good-sized pine trees will grow up, in 25 to 40 years, on an area over which the trees have been cut, in the Western states, but the timber is not so suitable for mine use as the older trees of the previous growth.

Ore-cars having side latches are not usually so well liked for underground work as those fitted with end latches. The side latches occasionally catch on timbers when passing, particularly in mines where the ground is heavy and the timbers shift.

The handling of ore or waste underground by means of wheelbarrows, is seldom economical. It usually involves many short delays, and the amount of material that may be moved per barrow is relatively small, and consequently expensive.

Antimony usually occurs as the sulphide, stibnite, but also occasionally in native state. There are several California localities where native antimony has been found, among them San Emedio canyon, in Fresno county, and near Corona, Riverside county.

Steel winding ropes rarely can withstand a tension on the wires collectively equal to the aggregate strength of the single wires. A rope was broken, under test, by a pull of 250 tons, whereas the aggregate strength of the individual wires comprising the rope was 320 tons.

The export of metallic copper during any particular month does not necessarily indicate the consumption of the metal during that or the succeeding month. Often large quantities of copper are bought on speculation. Not infrequently copper bought by speculators is transshipped several times.

The safe load that may be placed on beams of Oregon pine can only be determined when the dimensions of the beams, and the distance between the supports are known. Engineering books, like Trautwine and Kemp, give tables by means of which the required information may be worked out.

It is neither customary nor good practice to roast ore that is to be concentrated, as better results can be had with the raw ore. Some gold ore difficult to amalgamate, owing to presence of some deleterious substance, such as molybdenite, graphite, talc, or some other mineral with a greasy, unctuous feel, may in many cases be concentrated to advantage.

The stock of any corporation organized under the laws of California is assessable, no matter what promises or explanations are made by promoters. Mining and other corporations organized under the laws of other states and doing business in California are subject to the laws of this State.

Many do not know that some of the great copper mines of Bingham, Utah, were, at one time, lead-silver producers, the copper ore coming in at greater depth. At the junction of the Galena and Jordan veins, in the early history of that camp, over 100,000 tons of lead-silver ore were mined, producing $2,000,000.

Where the owner of a mining claim allows another to operate his property under bond, and the owner places a notice on the claim, stating that neither he nor the property will be responsible for the debts contracted by the operator, no labor liens or attachments can be legally placed on the property.

The gold-bearing quartzite of the Battle Mountain district above Leadville is at the same geological horizon as the quartzites lying under the Leadville silver-lead orebodies. These mostly occur in limestone, but little effort is made in Leadville district to prospect for gold, outside of the porphyry area back of Breece hill.

Mufflers to minimize the noise of the escape of exhaust steam from high-pressure steam engines are sometimes needed. A good muffler is made by inserting, near the engine, a chamber of 15 or 20 times the volume of the cylinder and continuing the exhaust pipe from this chamber. This will do away with the disturbance caused by steam passing through a tortuous exhaust pipe.

To avoid the operation of the mechanic's lien law upon mines in the state of Nevada, the statute requires that the owner or person in charge shall post a notice within three days after he shall have had information of any construction, alteration or repairing, stating that he will not be responsible for the same. This notice must be posted in a conspicuous place on the mine buildings, or at some place where it can readily be seen.

There is no hope of finding either oil or coal in andesite. Rocks of this description are of volcanic origin, and while occasionally small pieces of carbonaceous matter are found in andesites, these are probably due to the carbonizing of trees and pieces of wood which became involved in the molten rock. There are numerous occurrences of these carbonized fragments buried in andesite at Virginia City, Nev., and at Bodie, California.

A good mine track for light traffic, where car and load do not exceed 2,000 lb., is made by placing a 2 by 4 scantling on edge, on ties which are notched to receive the scantling and held in place by wedges. The scantling is then faced with strap-iron ⅛-in. thick and about 1¼-in. wide. In some mines where there are two tracks in the main gangway, or adit, the outgoing loaded cars run on T rails, and the incoming empties run on a track built as above described.

The only way in which the rainfall of a place may be ascertained is by actual measurement, by means of a rain-gauge. These cost little, consisting of a metal vessel of given standard dimensions and a glass-gauge, on which are marked the proper graduations. The gauge, being of smaller diameter than the can into which the rain falls, gives a column of greater height, making the measurement easier and accurate. Evaporation must also be determined by actual measurement of the decreasing height of a column of water in an open vessel of uniform cross-section.

Mortars of stamp-mills should be anchored securely to mortar-blocks, to prevent their shifting. This may be accomplished by first securing the anchor bolts in the blocks. There are two methods in common use. First, holes are bored through a solid block and pockets cut in the sides at points corresponding to the lower ends of the bolts. Into these pockets are inserted heavy cast-iron washers of suitable shape and the bolts are passed downward through the auger-holes and heavy nuts screwed onto the threaded bolts. A better way is that of building up the mortar-block with two-inch plank. While the block is in course of construction, either on the surface or in the pit, the anchor-bolts are laid in, eyes having been turned on the lower ends by the blacksmith. Holes of proper size are bored horizontally through the block in a transverse direction, and directly opposite the position of the eyes on the anchor-bolts. Through the eyes, connected by the horizontal bore-holes, heavy bars—usually of railroad iron—are passed, and the block is then completed by spiking on the remaining planks, generally two courses. The upper ends of the bolts are in place and when the mortar is lowered onto the block it can be firmly screwed down. The bolts cannot turn where those with eyes are used, and the mortar may be held perfectly rigid by keeping the nuts tightly screwed up.

The pressure of the wind on a tramway, building or other structure, varies nearly as the squares of the velocities. Thus, a wind blowing at 20 miles per hour exerts a pressure of two pounds per sq. ft., while a wind with a velocity of 40 miles per hour causes a pressure of about eight pounds per sq. ft. The pressure on a broad surface is probably greater per square foot than on one of smaller area.

The United States Geological Survey announces that during 1905 there were produced in the United States 35,246,812 bbl. of cement, valued at $33,245,867. The use of cement is constantly increasing, and the material from which it may be made is abundant in certain localities. Excellent cement has been made from calcareous travertine as well as from pure limestone mixed with the proper amount of clay.

When a hillside, by reason of the large amount of clay present, causes landslips, this tendency to unstability may sometimes be largely overcome if not prevented altogether by driving adits into the hill and draining off the water which is responsible for the slips. In San Bernardino county, California, repeated landslips in the Cajon pass caused much delay to traffic on the Santa Fe railroad and the difficulty was overcome by making drainage-cuts, and constructing a roof over the piece of bad ground, nearly 600 ft. long and 50 ft. wide.

Large smelting furnaces can obviously be operated more cheaply than small ones. What the limit in the size of a blast-furnace is, has never been determined. Formerly a furnace 48 in. long and 36 in. wide was considered large. Gradually the size was increased until cupolas were built 2 in. or more in width at the tuyeres and 18 ft. long. Within the past year, this length has been increased and a furnace now in construction will be over 50 ft. long. Possibly this will not be the limit of length, if this huge furnace proves a success.

Much of the old machinery on the Comstock—in its day the best and most elaborate in the world—has been sold to other mines or to other industrial concerns, and some has been broken up for old iron. The hoist at one time used at the Belcher shaft was sold several years ago to an Oregon lumber company. The great pump at the Union shaft was mostly reduced to junk and re-cast into modern mining machinery. Back of the Combination shaft lies a heap of scrap-iron and steel, among which may be seen dozens of nickel-plated nuts and other portions of a mine pump. Extravagance in equipment was smiled upon, and even encouraged in those early Comstock days.

A valuable optical invention is reported by Consul-General W. A. Rublee of Vienna, who states that a Hungarian chemist, after years of experiments, has produced a fluid optical lens of great power that can be produced cheaply. A fluid substance is enclosed between two thin crystals, overcoming defects of ordinary lenses. The largest glass lens heretofore manufactured out of massive glass for astronomical purposes has a diameter of 49.2 in. and required several years, at a cost of many thousand dollars, to produce. Such a glass can now be made in a few weeks for about $500. Lenses of smaller diameter for photographic purposes and opera glasses can be procured at correspondingly low prices.

In a very steep shaft a skip may be prevented from overturning when in motion by setting the wheels on lugs projecting from plates riveted to the sides a short distance above the bottom, and placing a lug back of the side draw-bars. This permits the skip to dump automatically into the bins at the surface, but prevents it overturning backward in the shaft. Where the shaft has an incline of over 75°, it is safer to put in guide-rails either above the wheels, to prevent them leaving the track, or, better still, guides of the ordinary type. When either of these are in place, the skips can be run rapidly on either incline or curve, and almost as large a tonnage handled as in a vertical shaft.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Editor:

Sir—Without entering into the recent discussion on what constitutes a "true fissure vein," I would like to put in a plea for the term 'vein-zone,' as distinct from the common use of 'fissure vein,' which implies an individual vein. The vein-zone is a particular width in a mountain mass in which one or several individual veins may occur, or in which for intervals there may be no vein proper at all, only the barren habitat for veins. This zone may be one formed by, and occupied by, the line of principal faulting or crushing in the upheaval of the mountain mass. It is a zone of fault-breccia and slickensides; and it may range from a width of a few feet up to one hundred feet or more. It may contain one prominent vein or several minor veins, or for intervals there may be no vein at all, only barren slipped and crushed country rock. To illustrate, I recall a prominent calcspar and quartz vein that outcropped boldly on the crest of a mountain composed of thin bedded limestones and slates, and which for some little depth was very productive of rich silver-lead ore. Then it ceased. A long cross-cut was driven at the base of the mountain to cut the vein in its entirety at greater depth. But no vein was found, no quartz, calcspar, or ore, only a vein-zone a hundred feet wide of barren fissures with slickensided walls and breccia. The zone was there but not the vein; such as it was, it represented the central axial line of crushing and faulting in the mountain, which was folded into an anticline. At another place the vein-zone was more limited in width and consisted of a series of fractures with corrugated slipping planes and breccia, cemented by carbonaceous material or graphite, and with many so-called walls that faded gradually into the country on either side the principal crushed zone, containing the ore deposit. In this vein-zone there might also be long intervals in which there was neither quartz nor ore.

It not infrequently happens in certain regions of Idaho, in corrugated limestones and slates, that strong outcrops of quartz and of calcspar occur near the surface rich in ore, and miners, running a long cross-cut into the base of the mountain several hundred feet below that outcrop, are disappointed in not finding the vein and still go on, claiming it is shifted by a fault or change of dip or the like. In many such cases they have cut the vein-zone where it ought to be and they have not known it. The so-called 'true fissure vein' or single individual lode between two defined walls is by no means so common and normal an occurrence of ore deposit as the vein-zone.

ARTHUR LAKES.

Denver, June 12, 1906.

THE JURY SYSTEM AND MINING LITIGATION.

The Editor:

Sir—A question of much moment to the miner, in common with persons in other lines of business, is the manner in which conflicting claims are adjudicated in our courts. The matter of trial by jury, and the retaining of this old system of trials, has been discussed in all its bearings by many of our most eminent men, both legal and lay, but at present it would seem that no consensus of opinion exists. The question remains open.

The point of most interest to mining men is whether it is the system best calculated to determine, with absolute impartiality, the respective rights of litigants and whether or not it best conserves the interests of all concerned. It is the purpose of this letter to provoke discussion upon a subject fraught with much importance to all engaged in the mining business; if it arouses any interest among your many readers and stimulates a ventilation of the ideas involved, some good may be accomplished.

Has the average juror a proper sense of the responsibilities of his position and has he a clear apprehension of the duties devolving upon him, both legal and moral, when sitting in judgment at a trial? I venture to answer this negatively.

For the purpose of argument and to support the contention that the average layman doing jury duty does not fully realize the great, even solemn duty that devolves upon him in that capacity, let us for a moment liken him to a voter at the polls. We know that in this case it is too often true that the main issues are lost sight of or ignored and that many votes are influenced by considerations of a personal character; in short, it is more frequently a case of choosing what is expedient rather than what is right.

Is it not true that many men, when being examined in regard to their qualifications to sit as jurors in a case, answer the questions satisfactorily and yet have in their hearts a lurking prejudice against the one side or, in default of this, some degree of sympathy for the other? It may be argued that the same may be said in regard to the Court itself, but this does not hold true, for many reasons. The juryman fills a judicial office but a short while—a few days or weeks at most—and then goes back to his place in the ranks; he has no judicial reputation to make or maintain; if he is in sympathy with either litigant—or, what practically amounts to the same thing, prejudiced in any way—if he is not thoroughly imbued with a sense of his responsibility, he is very liable to allow his decision to be warped and swayed by personal feelings.

The judge, on the contrary, cannot afford to do this; he is elected or appointed to administer the law as he construes it; he has his reputation at stake; if he errs in any way he is liable, either to ridicule on one hand, or a reversal by an Appellate Court on the other. It is not a pre-requisite in a juryman that he have a knowledge of law; that is stated by the Court; the only function of a jury is to bring in a verdict in accordance with the law as enunciated by the Court, and the evidence as adduced at the trial. This brings into play the reasoning faculties of the juror; and that different lines of reasoning are indulged in by almost as many different persons, the average verdict amply proves. It would appear, therefore, that the personal equation is an important factor in the present jury system. That jurors are not always governed by their oath in these matters, is a fact so well known that it almost seems unnecessary to try to prove it—but I will cite just one case of which I happen to have personal knowledge.

A mining suit was tried before a jury in one of our district courts a few years ago. The suit was brought by a mine-owner to recover from a lessee the share of the proceeds of the ore mined, which plaintiff claimed was rightfully his under the terms of the lease. According to one clause of the agreement, the lessee was to pay royalty only on ore that went over a certain grade. The lessee owned and operated his own reduction plant and it was made clear at the trial that he had mixed in sufficient waste rock with the ore in mining it, so as to keep the grade below the royalty point; consequently when the treatment charges (which were high) were paid, there was nothing coming to the mine-owner. Although fraud was clearly proved at the trial, yet the sympathies of the jurors were so overwhelmingly in favor of the defendant that they brought in a unanimous verdict in his favor.

Many cases of a similar character might be cited in this connection, but it is not necessary, nor is it germane to my present purpose to enter into a discussion of many other features of the jury system such as expense of maintenance, difficulty and delay in securing jurors, etc. The question before those engaged in the mining business resolves itself to this: Is the system the best one that can be applied in order to obtain a just determination of the rights of the litigants, and would anyone be liable to injury were it abolished and mining suits tried before the Court without a jury?

In cases when the Court might desire enlightenment on obscure points that could not be made clear in the regular course of the trial, a commission might be appointed, either by the Court itself or by stipulation of parties. This should consist of men competent to deal with the points in question, who could give the matters at issue intelligent investigation and bring in their findings to the Court, thereby elucidating it and facilitating a decision. On account of the very nature of things, one of the parties is sure to feel aggrieved when the decision is announced, and in that case he has his means of redress, as under present conditions, in appeal to a superior court. There the whole matter is taken under review and the Court, without any assistance from a jury, will pass upon the case according to its merits, so that no one's interests are ultimately jeopardized any more than under the present jury system, which is unwieldy and unsatisfactory in many ways.

EDWARD W. RALPH.

Butte, June 28, 1906.

Copper Statistics.—L. Vogelstein & Co., of New York, give the figures of the German consumption of foreign copper for the months January-April, 1906, as compared with the same period of time for 1905 and 1904:

	1906	1905	1904
Imports	42,946 tons	32,172 tons	40,859 tons
Exports	4,142 "	4,413 "	2,651 "
Consumption	38,804 tons	27,759 tons	38,208 tons

The Leonard Head-Frame.

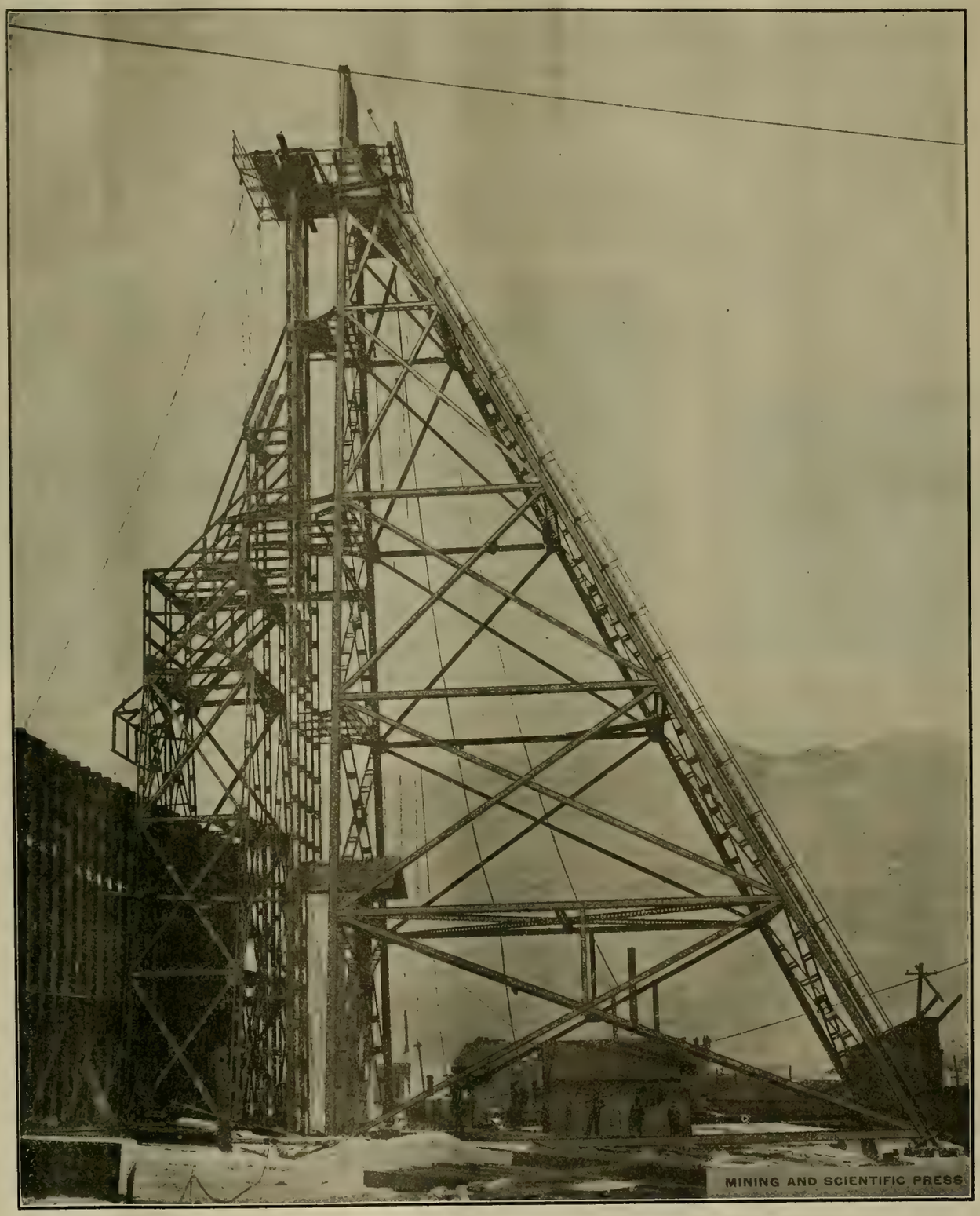
Written for the MINING AND SCIENTIFIC PRESS by A. H. HALLORAN.

The Boston & Montana Copper Mining Company, of Butte, has recently erected a steel head-frame at the new Leonard shaft. As the old Leonard shaft was taxed beyond its hoisting and pumping capacity, raises were run from the 500 and 1,200-ft. levels under a shaft that was 300 ft. deep; sinking from the bottom of this and raising from intermediate levels has made a four-compartment shaft, 1,200 ft. deep, that is to be used in hoisting all the Leonard ore. The new head-frame illustrated herewith embodies the most modern ideas in steel construction and is designed to give maximum strength with a minimum of material. The members have all been calculated to withstand the stresses due to load and the strains due to vibration. The estimated force-resultant falls just within the base of the inclined member. In comparison with frames on other Butte mines, it is both lighter and stronger. From the collar of the shaft this head-frame rises 140 ft. to the centre of the sheaves and 152 ft. to the top of the frame, the whole being surmounted by a 40-ft. flagpole. The two sheaves are 12 ft. diam. and will carry 1½-in. round cable. The base is 47 ft. 6in. by 68 ft., exclusive of the guide-frame and ore-bins. The main members are built up of two 12-in. channels and 1⅜ by 16 in. cover-plates outside, and lattice-work inside. The guides are of steel and are designed to sustain no great weight. The structure is cross-braced throughout to withstand vibration and other strains. Concrete piers form foundations for the frame and ore-bins.

The skip-dump and bins contain several novel features. The ore is to be hoisted in skips, automatically dumping into the skip-bins, from which it is drawn into a 10-ton electric tram-car which runs on a track over the railroad bins and distributes the ore to them. The skip ore-bins are 14 ft. long, with inclined floor giving a capacity of nearly 150 tons. The railroad ore-bins are 26 ft. wide and 150 ft. long, with a capacity of 3,000 tons. The ore from the skips is dumped into skip-bins by a swinging chute. Air-lifts are used on all the dumping gates. The dumping level of the skip-bins is 75 ft. above the ground, that of the railroad bins 50 feet.

In the lower part of the skip-bins is the apparatus for changing from skips to cages. In hoisting ore, a five-ton skip with a single-deck cage above is to be used, in lowering men four-deck cages will be employed. A radial swinging guide can be opened in the guide-frame, allowing the skips or cages to be swung into their respective pockets marked by the stationary guides. This is automatically controlled by air-cylinders and latches, allowing the change from one to the other to be made in less than three minutes by one man. The skip is attached to hoisting rope by clevis and king-bolt, the bolt being chained to the rope to prevent danger of its falling. The gallows-frame was designed by L. T. Sicka and is being erected under the supervision of Fred Brule. The labor and material are furnished by the American Bridge Company. Hoisting will be done with a Nordberg engine with 32 by 72-in. cylinders and carrying 1½-in. round cable, good for 3,500 feet.

Electrical engineers in the direction of the larger apparatus factories are all of the mind that the tremendous demands for copper in 1907 will doubtless cause an advance of prices for lake and electrolytic that will make present quotations seem low. American manufacturers of electrical supplies find by studies of plans decided upon in North America and Europe for hydro-electric power and railroad and telephone installations in 1907 that the volume will be largely in excess of the contracts awarded in the last eighteen months. In hydro-electric power transmission undertakings alone, that have been determined upon for construction in Europe and America during 1907, statistical engineers estimate that 175,000,000 lb. of copper line material will be required. Switzerland is planning the nationalization of her sources of water power in order to electrify her railways. Italy, in pushing Genoa to be the first port of the Mediterranean, is going to add largely to her electrified roads. Germany, France, Austria, Belgium, Holland and Great Britain are about to begin electrical engineering works of great magnitude. The London county council has decided upon building fourteen great electric power installations, and the amount of work coming on in North America is astonishing electrical engineers. Telephone engineers at home and in Europe are all certain that 1907 will break all records for the consumption of copper wire.



THE LEONARD HEAD-FRAME.

The Imbert Process.

Written for the MINING AND SCIENTIFIC PRESS by E. GIBBON SPILSBURY.

Anything in the way of a new smelting process for the production of zinc from its sulphide ore is apt to be looked upon with considerable distrust by metallurgists in general. There is no other metal in commercial use which offers so many difficulties in its production, and certainly few branches of metallurgy have had more money invested unprofitably in endeavors to improve it.

Notwithstanding all these efforts, the only practical dry process in use today is the same which was evolved some seventy years ago, of distilling the oxides of zinc by means of direct contact with carbon in closed retorts. All efforts so far to make a radical change in this smelting process have turned out failures, chiefly owing to the fact that zinc vapors, especially in their nascent state, have such an extreme affinity for oxygen, that not only must they be protected from contact with the atmosphere, but also from the presence of carbonic acid, which they readily decompose at a temperature of 600° C.

It is readily understood that these peculiarities absolutely prohibit the use of any open combustion methods of reduction, such as any form of blast-furnace or reverberatory hearth. All the necessary heat for the distillation must therefore be passed through the shell of the retort. In order to remove all oxidizing reagents, it is necessary thoroughly to roast the sulphides before charging the ore in the retorts, and thus convert them into oxides. To again reduce these oxides, a considerable amount of fuel is required, which takes up much room in the retort, so that the average amount of ore which can be charged at a time is not over sixty pounds.

The volatilization temperature of metallic zinc is between 950° and 1000° C, but the temperature of the reducing point of zinc oxide by carbon, is from 1250° to 1300° C. It is a pretty well understood fact that the reduction of the oxidized ores is produced mainly by the actual contact of carbon, and not alone by CO. Nevertheless considerable CO_2 is bound to be formed and therefore it is necessary to remove the Zn vapors as rapidly as they are generated to a temperature lower than 600° C so as to prevent their re-action on the CO_2.

It is readily seen from the above that the metallurgy of zinc is not only a complex but also a delicate operation, and that any discovery which would tend to simplify and lessen the manipulation in the process would be a great benefit to the trade. The latest improvement in this direction is the invention of a French engineer, Antoine Henri Imbert, of Paris, who has patented a process for the extraction of a certain range of metals from their sulphides. An understanding of the theory of his process may best be had from his own description in his patent application.

Copper is well known to act as a very energetic desulphurizer toward most of the ordinary metals. In particular, if copper be mixed with blende or with galena or with a mixture of these two sulphides, constituting a complex ore, and if the proportions taken be such that the whole of the sulphur is combined with the copper, the other metal or metals being liberated, then on the mixture being suitably heated the following reaction will be set up:

$$ZnS+2Cu=Cu_2S+Zn, \text{ or}$$
$$PbS+2Cu=Cu_2S+Pb, \text{ or again}$$
$$ZnS+PbS+4Cu=2Cu_2S+Zn+Pb.$$

Generally speaking if M be taken to represent the metal whose affinity for sulphur is inferior to that exhibited by copper, the reaction

$$MnS+2n'Cu=n'Cu_2S+nM$$

will take place.

The next stage of the process consists in recovering the copper, which as is well known may be easily effected by the bessemer process, namely by blowing air through the resulting copper sulphide. Hence the same copper may be employed indefinitely for treating fresh quantities of raw material. In practice, the following method is adopted: For the extraction of lead a mixture is prepared of coarsely crushed galena and granulated metallic copper in exact proportion to saturate the sulphur of this galena and to form copper sulphide, Cu_2S. The mixture may be placed, for example in a crucible capable of resisting the action of galena, preference being given to a graphite crucible, and the whole is heated to a relatively low temperature, about 800° C. The method employed for treating blende is exactly the same, and at the commencement of operations the reactions are identical. The blende, which by itself is almost infusible at a very high temperature, fuses readily in presence of copper at a temperature approaching 1000°. Between 1100° and 1200°, the zinc escapes from the molten mass with great rapidity and under violent ebullition, and may then be condensed (preferably to the molten state) by any known means.

The same procedure may be adopted with a complex mineral containing zinc and lead in any relative proportions whatsoever. The same phenomena occur, but at temperatures varying in accordance with the predominance of one sulphide or the other. If care be taken to protect the lead which accumulates at the bottom of the crucible from exposure to the greater heat necessary for vaporizing the zinc, the contamination of the zinc vapors with those of the boiling lead is prevented. In all instances where the process can be employed, the whole of the copper introduced into the smelting bath is recovered as a residue. This copper is in the form of sulphide, Cu_2S.

Now, it has long been known that when a matte has been obtained in the treatment of copper ores it is possible by means of Manhes and David's adaptation of the bessemer process to the metallurgy of copper, to reduce the copper to a metallic state by blowing air into a molten copper sulphide remaining as a final compound after the iron has been removed by scorification at the expense of the converter lining. Therefore, by applying this method to the copper sulphide remaining as an indefinitely renewed residue of the application of the present process, the whole of the copper introduced into the initial mixture may be recovered in the state of metal.

There cannot be any appreciable loss, the copper sulphide being pure, and free from any concomitant scorification. At the same time the lining of the converter remains intact, and may be made of graphite or any material that does not react on copper sulphide. This recovery of the reagent is effected without any consumption of fuel beyond that requisite to furnish the motive power for supplying the compressed air to the converter. It is advantageous to heat the mineral beforehand in any kind of crucible or even in an open hearth reducing furnace. The output of the apparatus is thereby considerably increased with quite an insignificant increase of fuel.

From the foregoing it will be seen that the advantages in favor of the process are many. In the case of simple ores, galena or blende taken separately, these advantages are: Abolition of any preliminary roasting; the consumption of fuel is reduced to the minimum necessary for the fusion of the galena at a moderate temperature, followed immediately by the removal of the lead and the recovery of the copper. In the case of blende, the consumption of fuel is reduced to the amount required for effecting fusion at a medium temperature and maintaining that temperature during the distillation of the zinc, which is effected rapidly, the entire reaction being performed during the period of fusion. There is an important saving in the wear and tear of the vessels employed for the reaction. There is a considerable decrease in manipulation. In the case of complex ores, mixtures of galena and blende in any proportions whatsoever, there is no need for any separation of the two sulphides by hand or mechanical appliances; nor of any concentration process.

The treatment is restricted to a simple process of fusion, followed by distillation of the zinc liberated in large bubbles from the molten mass; and, finally, there is opportunity for a complete and easy utilization of ores very abundant and generally left unworked.

From the foregoing description it also follows that the process is applicable to the extraction (from their sulphides) of all metals whose affinity for sulphur is inferior to that of copper; furthermore that no special form of apparatus is necessary for carrying out the process.

The manner in which the process is being carried on at the inventor's works, at Izzy, France, is as follows: The furnace, while only an experimental one, is really a full unit of what would be the regular type in practice. It consists of a graphite retort, similar in shape to those used in gas works, but of the following dimensions: Length 3 ft. 8 in.; width on bottom 12 in., and height in center 9 in., supported back and front, in a suitable furnace, for distributing the heat equally all around the retort. The front of the retort is closed by a cast-iron fire-brick lined front provided with the necessary charging apertures and tap-hole. An opening in the upper portion of the back of the retort communicates with the chamber where the metallic vapors generated in the retort are condensed, and subsequently run out into molds.

The retort having been suitably heated, the charge consisting of some 80 lb. zinc-blende mixed with about 8% of its weight of lime, is introduced. The charging aperture is closed, and the ore is heated up to a dull red. During this period, the rear opening is left in communication with the atmosphere, to permit the escape of the vapors from any moisture as well as the water of combination in the blende. This process takes about 20 min. At the end of this time the charging door is opened and the requisite amount of molten copper is poured into the retort, which is at once closed. The heating is continued and at the end of about one hour the molten zinc begins to appear at the tap-hole of the condenser. The production during the next two hours is normally at the rate of 24 lb. per hr., and as a rule, by the end of the fourth hour from 92 to 94% of the zinc contained in the ore has been recovered.

As soon as this point has been reached, the entire charge, which by this time is in a molten state, is drawn off through the tap-hole into a suitable settling-pot, which allows the separation of the copper-matte from the small amount of slag present. This matte would in practice be passed to a small converter of the usual type and blown to blister copper, which is then ready to be used again in the following charges. As any gold and silver contained in the original ore are entirely concentrated in the copper-matte, the resulting blister copper, after a series of operations, becomes rich enough to be treated as bullion, and in that case would be replaced by fresh copper.

At the first glance, the use of a reducing agent, worth nearly three times the value of the metal to be obtained, appears open to serious objection, but when we consider that the converting of copper sulphide to blister copper, is the regular method employed in nearly all of our works for the treatment of copper-mattes, and that the copper losses by this process rarely exceed 2%, the objections do not appear so serious after all. As a fact, while the converting of the ordinary matte produced in our blast-furnaces does entail a loss of about 2% of the copper contents, it is well established that the largest amount of this loss is due to the presence of so much iron in the matte. In converting the almost chemically pure copper sulphide produced by the Imbert process, no such losses occur. The average loss established so far appears to be not over 1%, which at the present market price of copper would be less than half a cent per pound on the zinc produced.

It is of course too early to predict what effect this invention is going to have on the general metallurgy of zinc, for notwithstanding the claims made for it, it is always at best a long and tedious fight to disturb such an old established metallurgical process as that of the distillation of zinc, by the Belgian and Silesian methods. On the other hand, if the same results can be relied on in general practice, as those obtained in the unit furnace now being operated, the saving in the greater extraction alone, together with the shortening of the time required for the extraction, four-fifths nearly, will much more than counterbalance any losses in copper, and will lessen the cost of the production of spelter over ¼c. per pound.

But apart from the regular established zinc production, there is a wide field of application for this process, in the treatment of the complex ores of zinc and lead, and zinc and copper. In many places, notably in northern California, there are deposits of copper ore carrying large percentages of zinc-blende. At present this zinc is a detriment and a constant source of trouble and worry to the smelter. By the introduction of this process all necessity for the separation of these minerals is avoided, as is also any preliminary roasting. The zinc becomes an element of profit, and the ores, after its extraction, are in the best possible condition for blast-furnace treatment. The complex zinc-lead ores are especially well adapted to economical treatment by this process. Where water or other concentration methods fail, this process separates the lead and zinc perfectly, yielding on the one hand pure metallic spelter and on the other metallic lead. It is true that, in the preliminary process, the lead produced is somewhat alloyed with copper, but it is easily liquidated out, to a great extent, and the resulting crusts of leady copper are used over and over for further reductions. The treatment of antimony sulphides by this process appears to be also a great success, and to result in great economies over the present methods. Finally, while it is too early to predict with certainty just how far the benefits of this invention will reach, the practical work already done in the experimental furnace demonstrates the theoretical accuracy of the process, and also the fact that under most normal conditions, the cost of producing zinc from sulphide ores will not exceed that under the present system, and where complex ores are to be treated, a saving of 50% over the present costs may be fairly expected.

Covellite is a rare ore of copper. It is sulphide, of dark blue color, almost black. At the Rambler mine in Carbon county, Wyoming, it contains platinum.

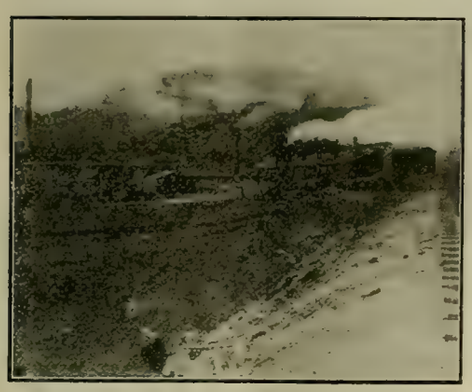
The Mount Lyell Copper Mine.

Written for the MINING AND SCIENTIFIC PRESS by
S. A. IONIDES.

The Mount Lyell copper mine is situated about 30 miles inland from the head of Macquarie harbor on the west coast of Tasmania. It was, and is still, one of the lowest grade copper mines in active operation, and for this reason, if for no other, it possesses exceptional interest and is worthy of special consideration by mining engineers. The grade of ore smelted was, a few years ago, about one and a half per cent copper, plus a small amount of silver and gold, and even now, after the absorption of the North Mount Lyell mine, the grade does not exceed 2.5 per cent copper.

The company (The Mount Lyell Mining & Railway Co.) possesses several properties within the range of a few miles of the smelter and connected with it by surface and aerial tram-lines. It has also several properties outside which will be mentioned later. The biggest orebody is a big blow of solid pyrite carrying 0.8 per cent copper and small values in silver and gold. It is worked by an open-cut and the ore conveyed over an aerial tramway to the smelter. At the present time the open-cut has been carried down to the level of the loading station of the cable cars, so an incline shaft is being sunk in the foot-wall of the 'blow' to hoist the ore to such a level that it may be trammed or sent over gravity planes to the loading station, the way in which all ore is being treated at present.

About a mile away from the 'blow' is the North Mount



MT. LYELL SMELTER.

Lyell mine. This belonged formerly to a separate company, but within the last three years it has been amalgamated with the Mount Lyell. The copper occurs here in the form of bornite, and is of much better grade than the pyrite in the 'blow.' The lode has been of variable size, pinching somewhat at the fourth level, but at the sixth a stope has been taken out to 60 ft. wide. This body is worked by ordinary underground mining methods from shafts sunk from an adit level. The ore from this mine has to be run along a steam tram-line, then down an incline by rope haulage, and again along a steam tram-line to the smelter.

The occurrence of these two deposits close to one another has proved fortunate, as they form an excellent self-fluxing mixture, needing only the addition of quite small quantities of lime and coke. The former is obtained from a quarry near the smelter and the company has its own coking works in New South Wales.

All the ore on the way to the smelter is carefully sampled. One out of every 25 buckets that go over the aerial tramway, and one out of every rake of trucks that go over the railway below the incline haulage are passed through the sampling mill, so that a reasonably accurate valuation of the ore going to the smelter can always be obtained. Just in front of the smelter bins all the ore is weighed. Each rake of trucks is weighed both on arrival and departure upon a special weigh-bridge capable of weighing ten trucks at a time. The buckets from the aerial tramway are weighed on arrival only, but their tare is checked about every ten days by weighing on departure.

The smelter is of the water-jacketed blast-furnace type, and does its work by pyritic smelting. The amount of coke used is about 60 lb. to a charge of half a ton of ore, so that practically all the heat must come from the burning sulphur. The heat at the feed-floor is with certain winds sufficient to seriously inconvenience the workmen feeding, so a few months ago mechanical feeders were being installed, in order that the men need not approach the furnace so closely.

Till about three years ago two plants were in use, each comprising five furnaces, of which four were in operation while one was being renewed. Then the addition of the North Mt. Lyell ore and the increase of the blast-pressure to 30 oz. so increased their smelting capacity that they were able to put as much through four furnaces as through eight previously, and their No. 2 smelter is the only one in operation now.

In front of the furnaces are four rectangular fore-hearths. The slag and matte together flow from one tap-hole into the first of these continuously. From the fourth the slag overflows continuously into a stream of running water, by which it is granulated and carried to a pit, in which are two centrifugal pumps. The slag and water are hoisted in these and run onto the slag dump. A by-pass is provided for occasions when one or another of the pumps must be stopped for repairs. From the first fore-hearth the matte is tapped every 20 minutes or so, and from the others a small amount is drawn three or four times every shift of eight hours.

The matte contains 40 to 50 per cent copper, and when cold is broken up and taken to the converter-house. There it is melted in a small circular furnace, and run down a movable trough to the converters. The converters are lined with silica obtained from a quarry near-by and last for six or seven charges without relining. A billet of wood and some briquetted flue-dust

MT. LYELL MINE.

are usually added to the molten matte and air blown in. Two lots of slag are first drawn off, and then the blister copper is ready to pour. The end reaction (by which the workmen tell if the charge is ready) is very sharp, and if a mistake is made, it is found out after a few pounds have been poured and air is blown in again for from a quarter to half a minute, and then the charge is ready.

The blister copper is the final product prepared at the mine, and is shipped to America for further refining and extraction of the silver and gold contents. The company has extensive machine-shops, in which all necessary castings and iron-work can be made. It owns and operates a narrow-gauge railway to Strahan, on Macquarie harbor, running passengers and freight trains. For part of the way it works on cogs on the Abt system. It has also an extensive mileage of 2-ft. gauge tram-lines for timber and mine use. Recently the company has started sulphuric acid and phosphate works in Melbourne to use profitably that part of the 'blow' which is too low-grade to be smelted for copper, and with its reserve fund it has acquired and is developing a tin property in the northeastern district of Tasmania.

At Mount Lyell itself, work has been done under great disadvantages. The early work had to be done through a dense and almost impenetrable forest covering a very hilly country. It is perpetually raining, the average rainfall being about 12 ft. per annum, and even short spells of dry weather render the region extremely liable to brush fires, and this in spite of the fact that the sulphur fumes from the smelter have practically destroyed all vegetation for a radius of six miles around.

It was decided several years ago by a Spokane, Wash., court, that the property, and not the stock of a corporation, is assessable.

The Lost Packer Copper Gold Lode.

Contributed to the MINING AND SCIENTIFIC PRESS by
E. P. JENNINGS.

This remarkable lode is situated in the Loon Creek mining district, Custer county, Idaho, 25 miles northwest of the town of Custer, and 120 miles west of Mackay, a station on a branch of the Oregon Short Line Railroad. The district was a noted placer camp 35 years ago, then abandoned until 1902, when the lode was discovered and bodies of chalcopyrite, containing 2 to 10 oz. gold were opened and shipped by pack-train and wagon to the railroad at Mackay, thence to the Salt Lake City smelters. Sufficient ore was produced in two years to pay for the development, which exposed large bodies of chalcopyrite.

The mine is situated on the southern slope of Packer mountain, which rises 2,000 ft. above Canyon creek, a small tributary of Loon creek, giving ample opportunities for exploration through adits, six of which have been driven; the lowest of these exposes the ore 750 ft. below the outcrop. Packer mountain is a complex of mica schist, knobs and bosses of granite and dikes of felsite and aplite, with its summit covered by a heavy sheet of rhyolite. This portion of Idaho is extremely rugged; the mountains having an elevation of over 10,000 ft., with deep valleys and canyons.

The lode occupies a shear-zone, which has been traced from near the bed of Canyon creek to the rhyolite sheet capping the summit of the hill, a distance of 5,000 ft., with a strike of N 5° E and a dip of 77° W; the minimum width of the lode is 30 ft.; it cuts both the granite

ANOTHER VIEW OF THE ORE.

and schist, and is faulted by the intrusive aplite and felsite dikes.

The ore is chalcopyrite, containing from 2 to 20 oz. gold and a small amount of silver. The high grade ore is compact and massive, occurring in well-defined shoots, 100 ft. long and 6 ft. maximum width, near the foot-wall; it is continuous to the lowest workings; another body of ore occurs near the hanging wall of the lode and separated from the foot-wall shoots by 25 ft. of mixed ore, schist and partially altered granite. These high-grade orebodies, averaging 15% copper, are enclosed in bodies of lean ore that are practically continuous for the full length of the tunnels and are mixtures of chalcopyrite, granular quartz and chlorite-sericite schist; the amount of chalcopyrite becoming less as the walls are approached. The narrow band of sericitic granite is intercalated between bands of schist near the center of the lode. These schist bands contain granular quartz, sericite and chlorite with small amounts of chalcopyrite.

The lode has been subjected to movements subsequent to its mineralization, both along its strike, as shown by the many slips and slickensides, particularly at the contact of the solid chalcopyrite and the low-grade ore, and also by transverse faults. A nearly horizontal felsite dike 20 ft. thick displaces the ore five feet to the west, between the second and third levels; a short distance below this dike two faults occur nearly parallel to it, these also displace the lode a few feet to the west. The lode is also faulted by two aplite dikes; one near its north end with an east-west strike that displaces it 20 ft. to the west, and the second, several hundred feet south of the first dike, that has a strike of N 20° E; the last mentioned faults both the lode and the horizontal felsite dike five or six feet.

The following minerals have been recognized in the lode: Gold and silver-bearing chalcopyrite, bornite, native copper, quartz, sericite, chlorite, barite, calcite, with malachite stains, hematite and limonite in the zone of oxidation. Pyrite, an almost universal lode mineral, is absent.

The zone of oxidation is 30 to 40 ft. thick, resting

directly on the unaltered sulphides that present no evidence of secondary enrichment except the occurrence of thin coatings of bornite in a few places and metallic copper in the quartz ore near the crossing of the aplite dike. Erosion has closely followed the weathering of the lode on this precipitous hillside; this in connection with the compact nature of the ore and lode-filling, is unfavorable to secondary enrichment.

The axes of the ore-shoots coincide with the principal shear-planes; the ore completely replacing the original granite, which may have been crushed by the formation of the shearing fractures, forming deposits of compact chalcopyrite. On either side of these shoots and separated from them by post-mineral slip-planes, the rock is more or less impregnated with chalcopyrite. Thin sections of this material show grains of quartz enclosed in sericite with chalcopyrite in irregular masses disseminated through the sericite and penetrating seams in the quartz. The quartz is evidently an original mineral of the granite and the sericite an alternation product of the feldspar. Thin sections from different portions of the lode and the granite walls exhibit abundant sericite and small amounts of chalcopyrite, the amount of the latter depending on its position in regard to the principal fractures.

The action of the mineralization processes was of too short duration to completely mineralize the shear-zone and a complex vein resulted, with the principal mineralization along those fractures that offered the least resistance to the solution. There is no evidence that any portion of the lode was an open fissure; it is a replacement of the more highly brecciated portions of the shear-zone, with an abundant formation of sericite replacing the feldspar and ferro-magnesian minerals. It can be classed with those metasomatic deposits of the sericite, copper-gold type, as described by Lindgren.

I infer that the formation of the shear-zone and its mineralization followed closely the granite intrusion, and that thermal waters, representing the last phase of the vulcanism that produced the intrusions of granite, were the mineralizing agents. The nature of these solutions is doubtful, but from the amount of sericite formed, they must have been rich in potassium salts, and contained gold, silver, copper, iron and sulphur; but they were deficient in silica, unless this substance was held in solution by an excess of potassium carbonate and deposited in the upper portions of the lode which are now eroded.

The remarkable features of the lode are the absence of all primary sulphides but chalcopyrite; the scarcity of secondary or vein quartz and all common gangue minerals that are directly precipitated from mineralizing solutions. The quartz present was undoubtedly a constituent of the original granite and the chlorite and sericite are derived from the hornblende and feldspar of the same rock. The later eruptives had no known effect on the mineralization beyond an increase in the gold content of the ore near the felsite dike, but their mechanical effects are shown by the numerous faults, slips, and schistose structure of portions of the lode.

My deductions are based on observations made during a brief visit in 1904, supplemented by information concerning later developments furnished me by John P. Boyle, superintendent of the mine, and L. Webster Wickes, mining engineer, and I also extend my thanks to both gentlemen for samples of ore and lode material.*

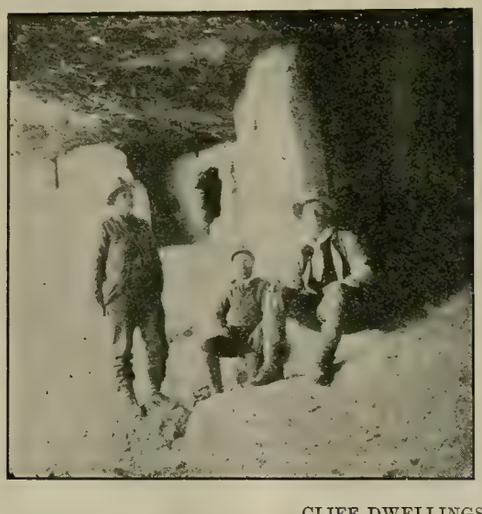
*This paper was also read before the Quebec meeting of the Canadian Mining Institute.

In the Aros Region, Mexico.

We are indebted to Mr. F. A. Stearns for the accompanying illustrations and notes concerning ancient dwellings near Chuichipa, in Sonora, Mexico. The cliff dwellings are in caves halfway up the mountain and overlooking a steep ravine; they are so arranged as to give protection from assault. Those shown in the photograph contain 19 compartments, the outer walls being pierced with port-holes through which a spear could be thrust so as to reach an intruder and hurl him 50 to 70 ft. down the face of the cliff onto the sharp rocks below. The doors are all constructed in the shape of the letter T, with a wide space for the shoulders and a narrow one for the feet, so that anyone entering had to bend to the knees and thus expose himself to a blow at the hands of the defender. The Aros river drains this region, which abounds in steep and picturesque ravines. While snow still lingers on the summits of the hills, the valleys contain palms and flowers in tropical luxuriance. The region contains many ruins of old patios and gardens; also abandoned mine workings, some of which may prove worthy of exploration.

THE VALLEY OF THE AROS RIVER, MEXICO.

A REST HOUSE.



CLIFF DWELLINGS IN SONORA, MEXICO.

Opal Mining in Australia.—The White Cliffs opal field is having a steady output of the better grade. One gem, obtained six feet from the surface, weighed 13 oz. and realized $500. The opal miners claim that the price for the gems is controlled by a ring, and that in consequence fair value is not obtained. The Opal Miners' Protective Association will therefore appoint an agent, to be sent to Germany and America, and will open up show rooms in Chicago for the display of polished opals.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Spokane, Wash., is: No. 1, Granodiorite.

The rock from Kingman, Ariz., marked No. 14, has every appearance of hornstone, veined with chalcedony, but the flaky brittle mineral is softer than typical hornstone. It is a very unusual rock, and this determination is not final.

The rocks from Florence, Idaho, were determined as follows: No. 1 Quartz with clay, stained with copper carbonate; No. 2 Quartz with limonite (iron oxide); No. 3, a metamorphic aggregate consisting chiefly of Quartz and epidote (the green mineral), with a little iron oxide.

The two rock samples from Eureka, Nev., marked T.P. are the variety of silica known as semi-opal, and are of no value except as specimens.

Copper ore occurring in schist or in eruptive rocks usually concentrates readily by ordinary wet methods, but the value of the concentrate depends upon the original character of the ore. Thus, bornite contains a higher percentage of copper than chalcopyrite. The amount of iron sulphide present also has a direct influence on the grade of concentrate as well as the perfection of concentration.

Submarine Drilling.

By E. P. Schaefer.

The conditions under which submarine rock excavation must be done are extremely difficult, calling for special apparatus of unusual strength and endurance. This character of work is nearly always carried on where tides, currents, winds, and storms are present in varying degrees, and these elements are antagonistic to economical and rapid work, and until recently involved such uncertainty as to require absolute daring to undertake river and harbor excavation; but, add to these troubles, deep water, irregular bottom, covered with mud, sand, or other shifting material which fills in almost as fast as removed, and a combination of difficulties results which, hitherto, has been considered almost insurmountable.

Owing to the increasing submergence of both ocean and lake-going vessels the removal of subaqueous material is daily becoming a more important feature. The deepening of channels is possible only because of the improvements which have been made in rock-drills, and today such work may be done effectively, rapidly, and cheaply. In modern submarine drilling, steels are used anywhere from 30 to 60 ft. in length and sometimes they weigh as much as 400 lb. To use them effectively even in hard homogeneous material is a problem; in poor material and under water, where the drill must be run by the sense of feeling, difficulties are multiplied, so that it is absolutely essential to have a drill which is at once massive, powerful, durable, and capable of perfect control through all ranges of length of stroke and weight of blow. The drill must, of course, be mounted on a barge or float, fitted with suitable framing to support the guides, the drills, the boilers and other auxiliary apparatus. The barge is towed into place and anchored by means of cables, anchor-chains or spuds, or a combination of these methods, depending upon the rise and fall of the tides or the currents to be encountered.

SUBMARINE DRILLING ON THE CLYDE.

In the accompanying illustration is shown one of the two barges which are, at present, working on a rock-blasting contract at Renfrew, near Glasgow. The work to be done consists of drilling, blasting and removing rock for deepening the channel of the river Clyde. Many thousands of holes must be drilled, the average depth of each being about eight feet. Occasionally, however, the bed of the river is such that a depth of ten feet becomes necessary and this drilling must be accomplished through a maximum depth of 30 ft. of water.

Each barge is provided with eight Ingersoll-Rand rock-drills. The drill used has a diameter of five inches and a length of stroke of eight inches. The drills take steam from two marine boilers at either end of the barge. They are connected to a main steam-pipe which runs behind the drills, and from which branch pipes, fitted with stop-valves, are taken. The drills are connected with these branch pipes by means of steam-hose. Immediately below the stop-valves are hand-winches which are used to feed the drills to the work or to raise them from it. The drills are supported in guides and suspended by wire-ropes which pass over pulleys at the top of the frame and under pulleys at the bottom, thus allowing a very accurate feeding of the machines. Behind these winches is a secondary and smaller winch provided with a wire-rope to hoist the drill-steels from the holes and replace them preparatory to drilling. The winches and the handles of the stop-valves are in close proximity so that one man can handle each machine.

The submarine tubes which are used in this contract consist of long lengths of four-inch screwed piping which may be extended to meet the rise of the tide. These tubes are forced through the overlying mud and sand to the rock-bed and serve to keep the advancing hole free from extraneous matter. The holes are drilled exactly as in the case of drilling down-holes on land, the drill being fed down as far as possible, then run back, a longer steel inserted, and so on, until the desired depth is reached, when the steel is removed and the hole charged with explosive through the tube. The casing tube is then removed, the wires connected with the blasting battery and explosion effected without shifting the barge.*

*Abstracted from 'Compressed Air.'

A Vale of Sinaloa.

In a recent issue of 'The Evening Post,' New York, Mr. Courtenay De Kalb, a well-known mining engineer writes a charming description of a valley in Sinaloa, Mexico. He says, in part:

Bacubirito enjoys a setting of exquisite beauty as first seen from the heights south of the great bend of the Sinaloa river on which the city stands. Its white buildings, and the tall, white, graceful spire of the mission church of San Pedro, in the midst of a spreading green valley, stand out in brilliant, cameo-like relief against the deep blue wall of the Sierra de Ocorahui, the first of the mighty ridges which mount ever higher to the region of labyrinthine canyons and snowy summits in the Sierra Madre. It is a beautiful picture, and arouses expectations which are not realized on entering the town. The church, though simple and inexpensive, is a model of elegant form, far surpassing anything that would be found in communities of 3,000 people in the United States. The early Spanish missionaries carried with them, and taught in enduring monuments, a fifth gospel of architectural beauty. How far they may be credited with the cultivation of artistic appreciation in other directions it were not easy to answer. That they taught the rudiments of many arts we know, but something must be allowed to the native tendency of the Mexican Indian to express himself in esthetic form, else it would be difficult to account for the rare modeling and wood-carving that one so often finds among the rude dwellers of the hills who have not even had the opportunity of seeing the prototypes of their own artistic creations. So strong is this tendency that one of the difficulties which the American constantly encounters in directing labor in Mexico is to prevent his carpenters, masons, and machinists from expending undue time in the refinements of detail. The Mexican reaches out after beauty as the flower does after light. He ornaments his person, and bears his finery with grace. He turns his saddle and bridle into works of art; the common arriero's mule-brushes are things to delight the eye by their form and color; when he fences in his cornfield he weaves patterns of beauty with his wattles twisted from post to post; he sleeps on a 'petate' woven with artistic designs. The spirit demanding that his works of utility shall combine a charm for the eye extends everywhere even to the humblest laborers. The factory and the impatient utilitarian foreigner are fast crushing out the expression of this feeling for beauty, and in the name of progress the Mexican may lay aside the arts of his childhood, and, hanging up his guitar, become songless and money-getting; or he may grasp at the culture of civilization behind the first wave of financial development that is rolling in upon his country, and find better and larger means for revealing the soul and talent that lie in him.

Eastward from Bacubirito is a maze of mountains, carved out of the western edge of the elevated plateau known as the Sierra Madre, interspersed with pleasant valleys, so deeply cut by ages of erosion that the semi-tropical climate has been carried back in long lanes from the lowlands of the coast, giving rise to the oft-repeated phenomenon of canefields and gardens luxuriant with bananas and papayas (the 'melon-zapote' of Mexico) surrounded by towering mountain walls leading within rifle range of pine-clad summits that invite the winter snows. In this region are mining districts still celebrated, like that of San Jose de Gracia, and the multitude of copper-gold veins being developed promises a revival of mining on a large scale. Through Bacubirito once passed the commerce of the great mines of Trigo, and a considerable portion of that of the world-famous mining town of Guadalupe y Calvo, as well as that of the once noted Guadalupe and San Manuel gold mines at La Cunibre de San Manuel, a district again attracting capital from England and the United States. The copper mines of Mapiri, and the gold placers of the Descubridora arroyo at the very doors of Bacubirito, are also contributing to brighten the future of this decadent foothill city

Nickel Production.—According to a report prepared by A. P. Coleman for the Ontario bureau of mines, the only real competitor of Ontario as a nickel producer is the French penal colony, New Caledonia. Though the United States has dropped out of the race as a producer of nickel ore, it is still one of the most important countries for the refining and utilization of the metal nickel, much the greater part of the Canadian metal being treated at Constable Hook, New Jersey.

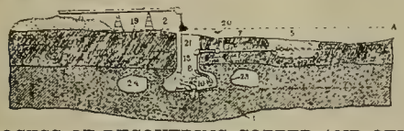
The Sudbury nickel field has long been known as the most important source of that metal in America, if not in the world, but the work of the last three years has brought out more and more strikingly the unique character of this mining region. It has been proved that all the ore deposits of economic importance are at or near the outer margin of a huge laccolithic sheet of intrusive rock a mile and a quarter thick, 36 miles long and 17 miles wide. This sheet is now in the form of a boat-shaped syncline, with its pointed end to the southwest and its square end to the northeast. The rock composing this sheet is norite at the outer and lower edge, merging into granite or granodiorite at the inner (upper) edge. The orebodies are round the margin of the norite, or along dike-like offsets from it, and have evidently segregated from the rock while still molten, though they may have undergone later rearrangement by circulating water. In a chapter devoted to the uses of nickel it is pointed out that Switzerland, Austria-Hungary, and France within the last few years have adopted pure nickel instead of the nickel-copper alloy for their coinage. The pure metal does not tarnish or change color, but keeps bright and attractive, and, as it is harder, the imprint stands wear much better. It is more difficult to counterfeit, since the minting requires more powerful presses. "Why," asks Mr. Coleman, "should not Canada, the producer of half the nickel of the world, replace her ugly cents by clean, untarnishable nickel coins, almost as handsome as silver and much more durable?" Canada is to have a mint, and it should begin its work by coining 1-cent and 5-cent pieces of pure nickel, making use of a distinctively Canadian metal. The nickel production of the Sudbury field for the calendar year 1904 is given as 4,729 tons, valued at $1,513,280, and the total production of the district since the discovery of the nickel deposits there up to and including the year 1904, at 43,877 tons, valued at $12,660,069.

Mining and Metallurgical Patents.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

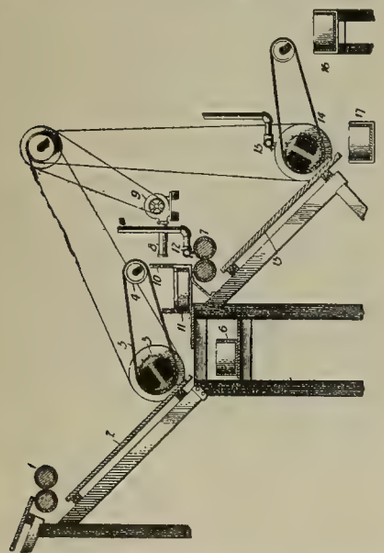
APPARATUS FOR MOVING AND MINING MATERIAL OF A GRANULAR AND COMMINUTED NATURE, No. 821,372. A. McDougall, Duluth, Minn.

In an apparatus for raising valuable material which lies in a layer at considerable depth below a layer of valueless material, the combination of the layer of valueless material having an opening therethrough and exposing the layer of valuable material, the said layer of valuable material having a chamber formed therein, and a sump within the chamber, columns or pillars sustaining the roof of the chamber, a reservoir formed on the layer of valueless material, a pipe or pipes connecting said reservoir and passing through the layer of valueless material and entering the chamber within the layer of valuable material, means for directing a stream or streams of water from said pipe or pipes against the valuable material, a lift pump or pumps within the chamber and having its or their inlet or inlets within the sump and discharging out through the opening in the layer of valueless material upon a dump formed upon the layer of valueless material, and means connecting the dump to the reservoir whereby the same water may be used for disintegrating the valuable material, carrying it in suspension to the sump and discharging it to the dump.



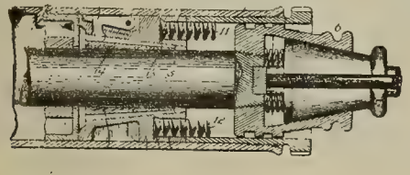
PROCESS OF RECOVERING COPPER AND OTHER VALUES FROM CERTAIN ORES, No. 821,516. T. J. Lovett, Chicago, Ill.

The herein-described combined dry and wet process of concentrating and collecting the non-magnetic sulphide and contained values in low-grade chalcopyrite ores carrying a material percentage of magnetic iron, which consists of the steps of coarse-crushing the ore in a dry state to reduce the sulphide and iron and allow of the dislodgment of adhering sulphide powder, magnetically separating from the dry reduced mass the disunited iron particles, dislodging from said dry iron particles and collecting the adhering sulphide powder, comminuting the remaining attracted material in a wet state to a degree of fineness which disunites the remaining iron particles from the other constituents, magnetically separating the disunited remaining iron particles from the wet mass, and finally collecting and saving the sulphide concentrates from the recrushed mass.



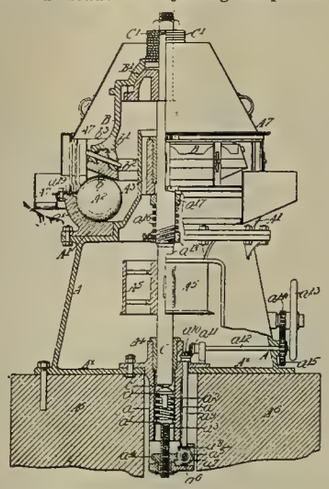
BEARING FOR ROCK-DRILLS, No. 821,325. T. E. Adams, Cleveland, Ohio.

A bearing-sleeve of low-carbon tough steel having a threaded exterior and having interior grooves, and also having a hardened interior face, the hardened portion confined to the portions of the interior face between the grooves.



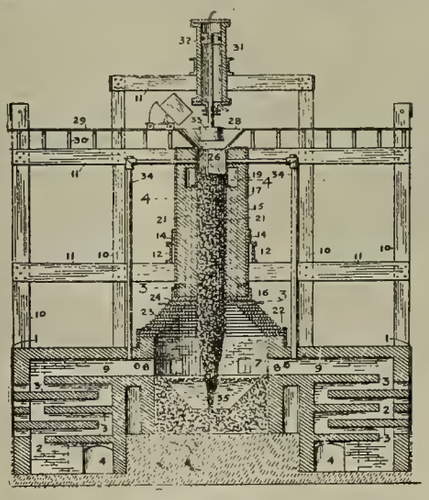
CRUSHING OR PULVERIZING APPARATUS, No. 821,421. W. Kitto, Barnes, London, England.

In a ball crushing-mill, the combination with a ball-raceway, a vertical driving-shaft extending through said raceway, and a bell-shaped ball-propeller driven by said shaft; of a resilient footstep for said shaft, a piston or platform vertically adjustable in said footstep and on which the lower end of said shaft directly rests, a spring interposed between said shaft and said piston, an adjustable buffer and means for adjusting the piston.



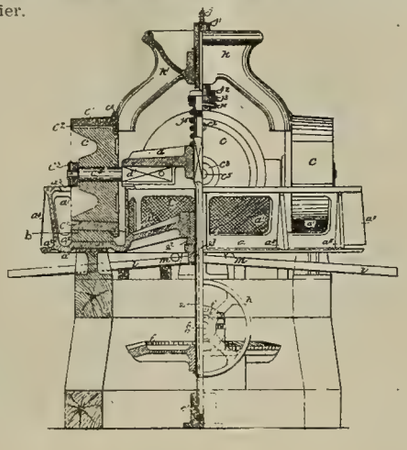
APPARATUS FOR SMELTING ORES, No. 821,190. J. A. Potter, San Francisco, Cal.

In an apparatus of the character described, the combination of a smelting-chamber having an open hearth, a conduit arranged to conduct products of combustion over said hearth, a retort-chamber over said hearth, open at bottom, whereby the material discharged from said retort-chamber descends into said hearth, and means for feeding the material into said retort-chamber.



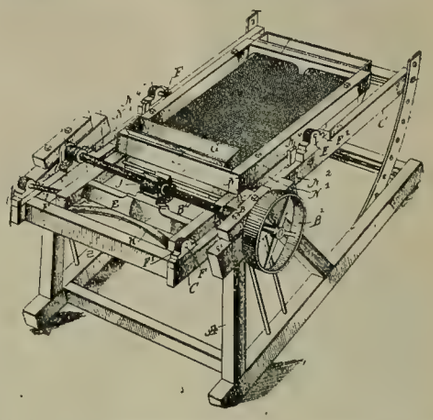
MACHINE FOR CRUSHING AND AMALGAMATING METALLIFEROUS ORES, No. 822,052. Hiram Jones, Ascot Vale, Victoria, Australia.

A machine for reducing ores comprising an annular trough, an inclined circular die therein, said trough having discharge-openings on both sides of the die, crushing-rollers running on said die, a central rotating shaft, a carrier mounted on said shaft and having vertical movement thereon and coupling-pins connected to the rollers and having pivotal movement in the carrier.



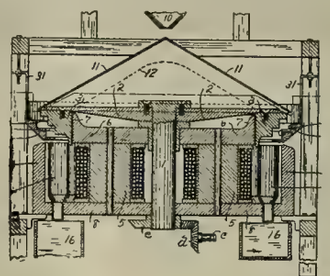
ORE-SEPARATOR, No. 821,430. Albert Perry, Caribou, Col.

A separator comprising a main frame, inclined radius-rods fulcrumed on the said main frame, an inclined swing-frame hung on the said radius-rods, a screen supported on the said swing-frame, a leaf-spring secured at its middle on the upper end of the said swing-frame, links pivotally supported from the said main frame and pivotally connected with the free ends of the said spring, a shoe on the upper end of the said swing-frame, a revoluble cam engaging the said shoe for imparting a downward-and-forward swinging motion to the said swing-frame and its screen, bumping-blocks on the sides of the main frame, adapted to be engaged by blocks on the sides of the front end of the swing-frame on the upstroke of the latter, a feed-hopper secured to the upper end of the screen, a concentrate-receiving hopper attached to and arranged under the screen, and a tailing-hopper at the lower end of the screen.



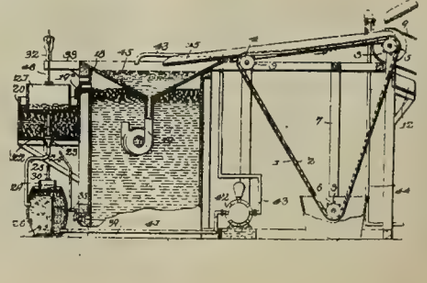
MAGNETIC SEPARATOR, No. 821,615. Myron Dings, Milwaukee.

In a magnetic separator, the combination of an upwardly-extending driving-shaft; a non-magnetic support mounted to rotate with said shaft; a magnetizable ring connected with said support; a set of magnets, arranged with cores parallel to the shaft at a less radius than that of said ring; segmental upper pole-pieces symmetrically balanced, and extending outwardly into close proximity to the inner faces of said ring; segmental lower pole-pieces of opposite polarity extending outwardly and upwardly into proximity to the outer faces of said ring; inclined non-magnetic shields extending downwardly and inwardly between said pole-pieces; and chutes extending from the lower ends of the shields downwardly through suitable apertures in the lower pole-pieces.



ORE-SEPARATOR, No. 822,515. Fred B. Finley, Los Angeles, Cal.

An ore-separator comprising a tank provided with an outlet-valve, a combined hopper and coil mixer arranged within the tank, a second tank into which the first tank discharges, a third tank into which the second tank discharges, a float-operated valve in the second tank for controlling passage of oil to the third tank, a valve in the second tank, a rock-beam, a connection between the rock-beam and the float of the second tank and the valve of the first tank, and means for supplying classified gangue and oil to the hopper.



Special Correspondence.

LONDON, June 13.

A leading event last week in the world of mining was the death of Sir Charles Tennant at the ripe age of 82. He was in the true sense a captain of industry. Besides being member of Parliament for one of the Scottish divisions between 1879 and 1890, he was chairman of most of the following companies and a director of all of them: The Union Bank of Scotland, the North British and Mercantile Insurance Co., the United Alkali Co., the Tharsis Co., the Assam Railways and Trading Co., the Linlithgow Oil Co., the New Cycle Co., and the Forth Bridge Railway Co. Of the Indian gold mining companies he was chairman of the following: Mysore (until within a few months of his death), Champion Reef, Balaghat, Coromandel, Gold Fields of Mysore, Kolar Mines Power Station, Road Block, and Sudan Gold Field. Having been one of the earliest and most persistent supporters of Indian gold mining, he reaped a rich reward. It is said his dividends from this source alone brought him an income of from £30,000 to £40,000 per annum.

The directors of The Zinc Corporation, Ltd., have issued their first half-yearly report to February 13, 1906. The Company was formed for the purpose of acquiring a large tonnage of mill-tailing, and the option of purchasing further quantities, under contracts made with four large Broken Hill mines. The Company has acquired the right to use the Potter process for the recovery of zinc, lead and silver, this process having been definitely proved to be successful on a large commercial scale. An option has also been secured giving the right to use the Elmore and Cattermole processes. The selection of the Potter process was determined chiefly because of its being advanced so far beyond the experimental stage, and because it possesses certain advantages of simplicity in working and low capital expenditure for the installation. The plant is working satisfactorily, and is now treating about 60 tons per day. Preparations are now being made for the addition of a ball-mill and other crushing appliances, and in a short time the capacity will be sufficient to deal with the whole output of tailing from the British Broken Hill Proprietary mine—about 2,000 tons per week. The directors state that they have concluded a satisfactory contract for the sale of zinc concentrate with Messrs. Aaron Hirsch and Sohn, the contract providing for the sale of from 10,000 to 20,000 tons of zinc concentrate during the current year, from 20,000 to 40,000 tons during 1907, and 40,000 tons per annum for the years 1908 to 1911, both inclusive.

The erection of a large central concentrating plant is receiving attention. A site for the same has been selected adjoining the South Blocks property, and orders have been placed for all the heavy machinery and plant. A good start has been made with the erection of a sulphuric acid plant, sulphuric acid being essential for the economic working of the Potter process.

The question of erecting zinc smelting works is also having attention, and in this connection the services of Mr. Augustin Queneau have been secured to go into the whole matter and report fully on same. This gentleman has been chosen by Mr. H. C. Hoover—one of the directors. Previous to this, Mr. Queneau had filled the position of consulting engineer to the New Jersey Zinc Co., at New York. The Zinc Corporation Ltd. started with a cash capital of £260,000.

At the third Ordinary General Meeting of Esperanza Ltd., the chairman, Mr. A. P. Hillier, gave an interesting retrospect of the Company. He said it was registered as recently as October, 1903, and has thus, up to the present time, had an existence of a little more than 2½ years. During that period considerably more than the entire capital of the Company has been paid back in dividends, which to date have amounted to 120%, or 24s. per share; and in addition to these handsome dividends, the directors of the Esperanza Mining Co. have been able to create a substantial reserve fund. The phenomenal increase in the prosperity of this Company may be said to have commenced with the development of the west sulphide veins, to the discovery of which attention was drawn at the last annual meeting. The shipping of ore from these veins began in February of last year, although it was not until July that it was mined in any large quantities, and the returns received by the Company from the smelting of this ore have produced results of an extremely satisfactory character. The gross receipts for the year ending December 31, 1905, amounted to £1,027,377, of which £584,643 was net profit. No other gold mine in the world, the chairman thought, had produced, during that same period, either more bullion or more profit. And at the present time the Esperanza continued, so far as he was able to ascertain, the greatest gold-producer in the world. He said the profits during the past six months would have been considerably greater even than they have been, were it not for the difficulty of obtaining a sufficient number of railroad cars to carry the ore to the smelters. The difficulty has arisen with the Mexican railways, which have been unable to meet the demand of the mine for cars. Turning to the future of the mine, the chairman stated that in his opinion its prospects appear to be of a most promising character. In the discussion which followed the chairman's address, a shareholder gave utterance to the time-honored plea on behalf of the London stock market for equality of opportunity with New York as to current information from the mine, and the chairman promised that in addition to the card giving the monthly results a quarterly progress report should be sent to the shareholders.

Notwithstanding the drop in tin (which a wag attributes to the lessened demand caused by the canned meat scare) Cornish mining 'setts' are said to be in great demand. It is rumored that Great North Downs and Wheal Peevor together with Wheal Rose will probably be worked with a capital of £100,000. These concerns are on the St. Aubyn estate. Thevool, near Grenville United, is mentioned in the list of likely starters, the capital named being £70,000. It is said that the following mines will be worked by a syndicate: Wheal Fortune, North Prosper, Wheal Crabbe, Wheal Virgin, Gwallon, Wheal Hampton, Tolvaddon, Wheal Caroline, and Owen Vean; that a license of the Wheal William, in the Luxulyan district, has been granted to a London syndicate; that four more setts have been acquired by the directors of Wheal Vor—Wheal Metal, Carleen, Polladrass, and Great Wheal Fortune; and that Penhale mine, Breage, will start at once. A scheme is also suggested in connection with the unwatering of Gwennap United mines. It is proposed to form a "pumping company," whose work it will be to unwater these mines, and then hand over the dry setts to new companies, the initial expenses being paid by the newcomers, and also a royalty being paid for pumping charges during the time the setts are being exploited for minerals. It is said that Wheal Geevor, St. Just, has been sold to a London syndicate, to be worked with capital of £40,000. The mine was formerly known as North Levant, and it is near the famous Levant, which is worked far out under the bed of the Atlantic, and which, from 1820 to date, has yielded profits considerably over £1,500,000 sterling. North Levant, or Wheal Geevor, stopped operations about a decade ago, at which time tin was only £40 per ton. It is only about 130 fathoms deep.

The statement made in Parliament by the Under-Secretary for the Colonies—Mr. Winston Churchill—that there is no general desire of the coolies employed on the Rand to leave their work and return to China, created something like a panic amongst the more extreme section of his followers. But the admitted fact that the famous repatriation proclamation, posted in Chinese at all the mines, has only resulted in 12 Chinamen, out of the many thousands employed, applying for permission to be transported back to their own country, has helped to calm the troubled breast of the shareholder in Kaffirs, and the record output of the Transvaal for the month of May of 461,202 oz., valued at close upon two millions sterling, should also tend to cheer his heart.

JOHANNESBURG, May 21.

A last effort was made by the mines to prevent the posting of the repatriation notices in the Chinese compounds. A test case, tried before the Supreme Court in Pretoria, was made by the New Kleinfontein gold mine. The decision of the Court was that the action of the Imperial Government was quite legal in offering to repatriate coolies desirous of returning to their native land. After this decision there was no alternative, so the notice was put up in the compounds. However, the action of the Chinese has been most gratifying. So far the offer has been practically ignored. A few coolies have signified their desire to return to China, but I doubt whether the total applicants will number fifty. This is about one-tenth of one per cent of the total number of coolies on the Rand. The danger from the poster is now practically over.

The mining industry should now have a period of six months' freedom from political disturbances. The next troubles start when Responsible Government is granted the Transvaal. Then the question of Chinese labor will be definitely settled. Meanwhile the feeling is more hopeful, now that it is seen that the coolies will not take advantage of the offer of repatriation. The agitation that took place over the posting of the notices was quite justified. It showed to the Liberal Party the indignation created by their policy of interference. Possibly this agitation will prevent further interference, which this blessed Party no doubt had in mind.

The market remains lifeless. If this depression continues there is no doubt that many of the shares will fall to a figure low enough for an investment. Heretofore most of the dividend payers of the Rand have stood at far too high a figure, from an investment point of view. The depression in the market valuation of shares has been enormous during the last eighteen months. This is a sign that people are ceasing to look upon Rand shares as speculations, but are considering them as investments.

For some time past, there has been a red-hot discussion on the Rand, regarding the policy of central administration in the management of mines. There has been a general expression of opinion that there is too much interference with the man on the spot, the mine manager, by the men in the head offices. As a result of the numerous letters and discussions, the system of central administration has been much modified, and in the future the mine manager will have far more authority than in the past. A group where central administration was carried very far is the General Mining & Finance Corporation, under the technical control of Messrs. G. A. and H. S. Denny. It is interesting to note that after a long trial of the system, the General Mining & Finance Corporation has given up the central administration idea, and the Dennys have left for pastures new.

An interesting excursion to the Victoria Falls is being taken by the members of the Chemical, Metallurgical & Mining Society. The May meeting of this society will be held within sound of the roar of the mighty waters. About 80 to 100 members and their friends went on this excursion. These outings to Victoria Falls are becoming quite popular in South Africa.

CANANEA, Mexico, June 20.

El Pinito mine, situated in the Magdalena district, State of Sonora, about 35 miles from the border, has taken a new lease on life. Two years ago the company operating it became involved in several lawsuits which resulted in the mine being shut down until two weeks ago. The company is composed of Washington people and the new manager is Lewis Randall. Under his supervision, the mine is being cleaned out and the 50-ton mill put in working order. The wagon-road, which cost about $15,000, is also being repaired and within a few weeks the mine will enter the producing class again. The return from the first month's milling was $40,000 from 1,500 tons of ore, and it is expected to beat this as soon as the mill starts running again.— The Cubana Mining Co. is ready to ship. This is a copper-silver property and is situated in the district of Arizpe about 110 miles from the American border. The stock in the company is owned by California people and the officers connected with the mine are also California people. The line of the Cananea, Rio Yaqui & Pacific Railroad will pass within a short distance of the mine, and as soon as the road is completed the management will ship daily 200 tons of ore running about eight per cent copper and carrying about 20 oz. silver. As the mine stands at present, there are 2,000 ft. of development work done, which shows up about 100,000 tons of ore.— The Cerro Blanco mine, 50 miles west of Cananea or about 70 miles from the American border, has been sold by the owner, H. C. Hazeltine, to an English company for $250,000. The English company, which will be known as the Cerro Blanco Mining Co., Ltd., of London, will commence operations at once and will make every effort to maintain a handsome production.— The Santa Rosalia mine, 12 miles northwest of Arizpe, is being rapidly cleaned out and preparations are being made to begin production. This mine is owned by George Mitchell and associates of New York, who bought it for $10,000. The mine is an 'antigua' and was recently re-discovered from the old Spanish records, where it is spoken of as being one of the richest gold mines in northern Mexico. The Spanish workings are 480 ft. deep with 500 ft. of drifts still in good shape. Ore running over 700 oz. gold and 1,000 oz. silver has been found on the old dumps and in the drifts. Machinery has been ordered for the property and it will be installed as soon as the mine is ready.

The Oro Maximo and Picacho mines are ready to produce. These mines are owned by the Oro Maximo Mining Co. and the El Picacho Gold Mines Co., both

companies being owned and controlled by the Clancy Bros. of Detroit. The managers expect to maintain a steady production of 100 tons daily, making a total of 200 tons. The Oro Maximo mill, which has a capacity of 200 tons, is being removed to the mine, about 40 miles southeast of Cananea. It is expected that the mill will make its first run in August. The development work on the Oro Maximo is being conducted in two shafts, one a three and the other a two-compartment shaft, and sinking is going ahead at the rate of four feet per day. Air-drills are used exclusively in the Oro Maximo and are being installed at the Picacho mine. This mine was recently bought from the Phelps-Dodge Co. by the Clancy Bros. and the work they have done on the property proves that they made a good bargain with the original owners. In the new shaft on the Picacho, ore running as high as $20,000 per ton has been found and the vein has widened to six feet at the 45-ft. level. There are over 400 men employed on the properties.— The Southwestern Mining Co., which controls the Ortega mine situated about six miles south of Cananea, is pushing work on the property and is putting on more men every week. The main development shaft, which is an incline, has run into ore running 10% copper and 18 oz. silver. This is in a drift at the 100-ft. level and where the ore is 40 ft. wide. The main shaft is down 200 ft. and has run into copper sulphide ore.— Ore running 600 oz. silver and carrying a high percentage of lead and copper is being shipped from the Alacran mine of the Arizpe Mining Co. The mine is situated in the Manzanal mountains about 17 miles from Cananea and the ore is packed about six miles to the main Arizpe wagon-road. It is the intention of the company to ship one carload of ore per week. Beside this mine, the Palo Seco, owned by the same company, is soon to enter the shipping class. The development work has shown that it is a copper mine of great promise, there being an immense body of low-grade copper-silver ore and quite a large amount of high-grade native copper.— La Chispas mine is again bonanza. This mine was one of the most famous under the Spanish regime and had a record of producing about $6,000,000 for less than 5,000 ft. of work. It is now owned by a French and American company with offices in New York, known as the La Chispas Gold Mining Co. The work done shows over $2,000,000 worth of ore in sight and the monthly shipments average a net return of about $85,000. The ore averages 18 oz. gold and 3,780 oz. silver per ton.

The Greene Consolidated Copper Co. has fully recovered from the strike which cost the lives of about 75 Mexicans and five Americans, and shut the entire plant down for three days. Outside of the time lost, the only other injury to the company was at the lumber-yard, which was burned by the strikers at a loss of $125,000. Despite rumors to the contrary, the mines and reduction plant were not injured in the slightest owing to the fact that they were well guarded. The entire mines and reduction division are being worked to their fullest capacity at present and it is predicted that the loss of the three days will be fully made up before the end of June. Beside the above company, the American mine, the Sierra de Cobre and the Cananea-Duluth were shut down for the three days of the strike, the agitators having forced the miners to go on strike against their will. These mines are in the Cananea district and employ about 500 men. The outlying camps, from that of the Southwestern Mining Co., which is only six miles from Cananea, to those of the Oro Maximo and Picacho companies, which are over 40 miles away, were not inconvenienced in the least by the strike. In fact, in most cases, the news of the strike did not reach them until it was all over. There was no trouble whatever and none of these mines lost a day.

BUTTE, June 24.

The new Davis-Daly Estates Co., which has given a contract to the Original Mining Co. to run a cross-cut 3,800 ft. long from the 1,800-ft. level to the Original mine south through the claims of the Davis-Daly Co. lying south of the Original and Parrot mines, is also planning to run another drift, 2,000 ft. northwesterly from the Original into the Mt. Moriah mine, another of its properties. Through the contract with the Original Co., the Davis-Daly Co. will be able to do in six months what otherwise would require three years. The Davis-Daly Co. expects to begin this work in a few weeks, and hopes to be able to produce 2,000 tons of ore daily within a year or eighteen months. The company has secured a site for a smelter on the Big Hole river, southwest of Butte, and a large plant will be erected there. The North Butte Co. has installed its new hoisting engine and made several trial runs without cable attachment. It will be ready for hoisting about July 1. The company is at present hoisting 850 tons of ore per day. With the new engine the output can be increased to 1,200 or 1,500 tons per day. Instead of cars and cages for hoisting, skips of four tons capacity will be used. The company has, for months, been opening its orebodies and blocking them out for rapid mining.

The East Butte Extension Mining Co. has purchased all the machinery and surface plant of the Columbus-Butte Co. at sheriff's sale, securing a $10,000 plant for about $1,200. The machinery has been moved to one of the Extension shafts where it is being installed. The Extension Co. is making regular shipments from two of its shafts. Sinking is in progress at the three other shafts.—For some time the Butte & Bacorn Co. has been hampered in shaft sinking by soft ground, but its three shafts are now in hard ground and better progress is being made. The shaft on the Colleen Bawn is down 145 ft., that of Belinda 160 ft., and the Calumet 150 ft., all timbered. The Calumet is the only one of the three that is in a vein. Talc, brecciated granite, quartz, and some iron are coming from the bottom. An effort was made to cross-cut to a vein at the 100-ft. point in the Colleen Bawn, but the ground was so soft that the cross-cutting endangered the shaft and the work had to be stopped to save the shaft. Another cross-cut will be started at a greater depth in firm ground. The company is sinking the Colleen Bawn shaft while the Belinda and Calumet are being sunk under contract. The new air compressor at the Belinda has been placed and is ready for use. The company's third hoisting engine, ordered two months ago, has also been delivered.—The shaft of the Butte Hill Copper Co., being sunk west of the Butte & Bacorn, has reached a depth of 200 ft., where a station is being cut preparatory to cross-cutting. The shaft is in the vein and peacock copper has been coming from the bottom.

A streak of good copper ore has been cut in the shaft of the Greenleaf, being sunk by the Boston & Montana Co. on the east side of the Butte district. Adjoining the Greenleaf, the Butte Copper Exploration Co. has reached a depth of 660 ft. in its shaft on the Six O'Clock claim. It will be put down 1,000 ft. before any cross-cutting will be done. Still eastward, and adjoining the Six O'Clock, the Butte & London shaft is down 400 ft., 175 of which are in bedrock. The new equipment for the mine is rapidly being put in shape. To the northwest, a short distance, are the properties of the Butte-Milwaukee Co., which are being developed by eastern capitalists.—On the west side the Butte Copper Mining Co. is making rapid progress in opening orebodies in the Trifle and Anselmo claims, both old properties. The mines lie on the strike of the vein on which are located the Rarus, St. Lawrence, Anaconda, Never Sweat, Original and Gagnon claims. The mines of the Butte Copper Co. lie just west of, and adjoin, the Gagnon group of the Trenton Co.—Nearly all of the Amalgamated companies are engaged in opening new mining ground, sinking shafts and developing their properties. The shaft on the High Ore mine, owned by the Anaconda Co., has reached a depth of nearly 2,400 ft. At that point a large station will be cut and drifts and cross-cuts run to open the ore-bodies for stoping. Connections will also be made with the other hill mines. The Anaconda Co. is also making preparations to resume mining in the Pacific and Poulin mines, which were shut down many years ago. They will be worked through the shaft of the Buffalo mine, which has heretofore been used by the Raven Co. for working its Snoozer mine. The Raven is likely to be compelled to sink a shaft of its own, although it has a promise that the Anaconda Co. will hoist its ore under contract as soon as the Buffalo shaft is operated again. The Raven has only a verbal lease on the Buffalo shaft, but the notice from the Anaconda Co. that it intended to use the shaft, came as a surprise. Since then the Raven mine has been shut down. It had been shipping 130 tons of ore per day before the shut-down. The Snoozer is one of the best new mines in the district. The Red Metal Co. owns a small interest in the mine, but that company's relations with the Raven have been entirely amicable.—The Parrot Co. is sinking the Parrot shaft deeper and has also started to reopen the Little Mina mine, the shaft of which will be sunk several hundred feet deeper. The Mina has not been worked for several years. The Parrot Co., in opening a new body of ore on the 1,800-ft. level of the Parrot mine, has again increased its daily output to about 500 tons.—A new shaft is being sunk on the Tramway mine by the Red Metal and Butte & Boston jointly, which when completed, will be used by both companies. Both own interests in the Tramway and Snohomish mines, and the Red Metal owns the Minnie Healey, which adjoins the Tramway and Snohomish. The Minnie Healey shaft, which for some time has been in bad shape, will no longer be used as a working shaft, but the three mines will be worked through the new Tramway shaft which will be sunk to a depth of 1,800 ft.—The Original Mining Co. has ceased shipping ore to the Washoe smelter, the entire output of the Original mines, about 900 tons per day, being again treated at the company's smelter in Butte.

The new hoist at the Cable mine has been completed and equipped with cages. Ore is now hoisted by cage instead of by buckets as formerly. Operations at the mine and mill were hampered last week owing to bad weather and slush in the water ditch. The mine is in good condition and is yielding the usual quantity of gold ore. The placer drilling machinery, which was stuck in the mud near the mine for several weeks, has been placed in position and the Cable Consolidated Co. will, in a few days, begin prospecting its placer ground, of which it owns more than 400 acres. If the results warrant it, the company will put in a dredging plant.— The East Butte Copper Co. is negotiating for the lease or purchase of the smelter of the Pittsburgh & Montana Co. If it succeeds in getting it, the plant will probably be re-built and used for treating the East Butte Co.'s ore exclusively. The company expects to increase its output to such an extent in a few months that additional smelter facilities will have to be obtained. The output at present is being treated at the Washoe smelter, but the capacity of the latter is taxed. The East Butte is also negotiating for additional ground adjoining its present holdings.—The Butte Central Copper Co. has sunk the Ophir shaft to 400 ft., adding 105 ft. last month.—The Lewisohn General Development Co. is sinking a new shaft on the Montgomery claim on the east side of the Butte district to catch the vein recently opened in the Birtha mine, which lies to the north of the Montgomery. The company is also exploring the 200-ft. level of the Altoona, where cross-cuts are being driven. The company will thoroughly explore the mines it has under option in the district southeast of the Butte.—The Lexington Mining Co. which, for years, was worked by lessees at considerable loss, and which a few years ago passed into the control of F. A. Heinze, has made a report to the tax authorities that has surprised them. It was the general understanding that the Lexington was costing a lot of money without producing anything, but the report shows that the net earnings for the year ending June 1, amounted to $149,986, the gross proceeds being $505,062. According to the report, there were mined during the year 33,095 tons of ore and the gross yield per ton was $15.26. The cost of mining was $6.50 per ton, transportation 36 c. per ton, and reduction $3.86 per ton. The total cost of mining was $215,282, freight $12,013, reduction $127,779. The gross yield per ton is exceeded by only one other mine in Butte, and that is the North Butte, which reports gross yield per ton at $21.11. The next highest is reported by the Boston & Montana Co. at $12. The Lexington ore yields zinc, silver and copper.—The Pittsburgh & Montana Co. also made a report during the past week, which shows a loss in operation during the year of $260,811. Its figures are as follows: Tons of ore extracted, 26,195; returns on matter shipped, $21,211; returns on blister copper, $300,220; returns on 4,172 tons of ore shipped to the Washoe smelter, $39,013; total receipts, less $6,729 paid for freight on copper, $353,716. Expenditures: Stoping, $105,596; development, $318,871; equipment, $19,609; smelter operation, $163,242; smelter equipment, $7,209; total expenditures, $614,528.

The Original Mining Co. of W. A. Clark is on the Gagnon vein to the eastward, and from a depth of 1,900 ft. the Original is hoisting 42% copper ore. West of the Gagnon the vein runs through the property of the Butte Copper Company.

The East Butte Extension Mining Co. has purchased all the machinery of the Butte-Columbus Co. and has placed it at its several shafts. A 120-h.p. boiler has been set at shaft No. 3 and it will furnish power for No. 2 and 3.

TORONTO, June 22.

The most noteworthy find recently made at Cobalt, is the discovery of a large vein of argentite on the McKinley and Darragh property, which is said to be the largest deposit of argentite so far struck here, containing about 87% silver. The Glen Lake Mining Co., of which R. A. Bailey is manager, has also made a strike, but the details are not forthcoming. The rush of prospectors up the Montreal river continues. The river runs in a northwesterly direction from the southwestern part of the Cobalt area, through the newly laid-out townships bordering on the Temaquami forest reserve, and all the region accessible by it is being prospected as far as Fort Matchewan and even further north. Steady work is being done on numerous pros-

pects, a comparatively short distance from Latchford, the point of departure. Many cobalt veins carrying silver are being worked, but no very rich returns are, as yet, reported. The general opinion is that more development will be needed than was required in Cobalt before these deposits become paying mines. One of the most promising localities is Portage bay, a large lake-like inlet on the east side of the river, three miles above Latchford, where several good discoveries have been made. On the Matawabika river, a tributary of the Montreal, 12 miles up, Mr. Klock of Orillia, Ont., has eight men at work on a quartz vein 11 in. wide with a copper-gold showing. Twenty-five miles up, Dr. Dakin, of Galt, Ont., has located a large deposit of copper-silver-nickel ore. Three copper veins are reported to occur here. Gasoline launches run for some distance up the river, carrying passengers and freight.

Active prospecting is also being carried on in the region southeast of the Cobalt district adjoining Lake Temiskaming. Many finds of silver, smaltite, and cobalt are reported. Silver-cobalt has been found at Point Fine, 20 miles south of Haileybury. The Department of Mines has been officially notified of the discovery of a small but very rich silver vein in Lorraine township.

Capt. John Harris, manager of La Rose or Timmins mine, Cobalt, was recently severely injured by a premature explosion of dynamite, which destroyed the sight of one eye. He is now in the general hospital at Toronto.

W. J. Hanna, Provincial Secretary of Ontario, has received a dispatch from the British Secretary of State for the Colonies asking for particulars of the recent explosion of seven tons of dynamite at Cobalt. The matter has been referred to the Bureau of Mines. S. Price, mining commissioner, has been kept very busy since his appointment, hearing mining disputes in regard to controverted claims to Cobalt locations. F. F. Lemieux has been appointed mining recorder for the Sudbury division, and C. H. Shera mining recorder for the Port Arthur division under the new mining law.

Mining operations in Eastern Ontario continue to show much activity, especially as regards mica, corundum and iron pyrite. There is a notable revival in the mica industry. The Lacey mica mine, owned by the General Electric Co. whose trimming works are at Ottawa, situated in Loughboro township, Frontenac county, is a heavy producer, employing 45 men. Three or four mica properties near Perth are also being actively worked.—The mine of the Canada Corundum Co., at Craigmont, Renfrew county, H. E. T. Haultain, manager, is yielding about 300 tons per month. There has been a considerable increase in the output of iron pyrite which is largely shipped to Buffalo to be used in the manufacture of sulphuric acid. The principal producing mines are those of the American Madoc Mining Co., near Madoc, Hastings county.—The Katharine lead mine, near Bannockburn, Hastings county, has been re-opened. The output of this mine and of the Hollandia is being treated at the lead smelter recently erected at Bannockburn.

One of the most important discoveries made for some time, as indicating the mineral richness of the region for a long distance north of the present productive area, has just been announced. A rich vein of calcite carrying galena, silver, and copper has been found on Lot 5, Concession 5, of Ingram township in the Wendigo Lake region. It averages five inches in width and has been traced for 600 ft. Several smaller leads run into it. The locality is about 30 miles north of Cobalt. Another large vein has been found at the Foster mine, Cobalt, seven inches wide and high in silver. A silver deposit recently found in Buck township yielded samples assaying upward of 24,000 oz. per ton.

SALT LAKE, June 25.

During June, 16 Utah mining companies have posted dividends aggregating $1,109,000. This includes the semi-annual and quarterly distributions of the Utah Consolidated and Daly-West. The companies and respective amounts paid by them were: Utah Consolidated, $750,000; Daly-West, $108,000; Silver King, $50,000; Gemini, $50,000; Consolidated Mercur, $25,000; Beck Tunnel, $25,000; Grand Central, $15,000; Horn Silver, $20,000; Mammoth, $20,000; Victoria, $12,500; Yankee Consolidated, $12,500; Swansea, $5,000; Sacramento, $5,000; Uncle Sam, $5,000; Utah (Fish Springs) $4,000; West Mountain Placer, $2,000.

All the surveys having been completed, the Continental Transportation Co., which has a lease on the right of way owned by the Rio Grande Western railway between Bingham Junction and Alta, will soon begin construction of a railway between the points mentioned. Rails are laid nearly all the way from Bingham Junction to Wasatch. Above Wasatch there will be some difficult engineering. The management promises to give mine owners of Alta a rate on ore sent to the Salt Lake smelters as low as that of Park City.—Five mining claims adjoining the Columbus Consolidated, at Alta, have been bonded to Joseph J. Bamberger of New York.—Fifty teams are now employed in hauling ore from the Columbus Consolidated mine at Alta, handling an average of 65 tons per day. The management claims the mine is earning $100,000 monthly.

The first report made in four years to shareholders of the Swansea Mining Co., has been issued. During that period the mine was idle about three years, but in the last year more favorable market conditions have enabled the company to operate profitably and from the 9,585 tons sold since May 15, 1905, there was derived a net profit above expenses of mining, transportation and treatment. In addition, money was received from royalties paid by lessees, making the total net result $17,836, out of which two $5,000-dividends were disbursed. The Swansea mine is situated in the Tintic district.—An option has been given on a control of the stock of the Carisa Mining Co., operating in Tintic district, on the basis of 45c. per share. The first payment is to be made in July and the last in October.—The ore shipments from the Tintic district last week aggregated 145 carloads, the shippers and amounts being: Gemini, 11; Bullion-Beck, 8; Scranton, 3; Dragon Iron, 16; Swansea, 3; Sunday, 1; Grand Central, 8; Mammoth, 20; Carisa, 6; Ajax, 2; Black Jack, 2; Centennial-Eureka, 41; Eagle & Blue Bell, 4; Uncle Sam, 3; Yankee Consolidated, 4; Eureka Hill, 3; May Day, 2; Beck Tunnel, 6; Godiva, 2.

Reports received from the Clifton district, in Deep Creek country, indicate that late developments made in the Gold Hill mine, controlled by officials of the Bingham Consolidated Mining & Smelting Co., are important. Little has been said about it, but it now seems likely that Clifton will become an important copper camp. The main line of the Western Pacific railroad, now building from Salt Lake to the Pacific coast, will run within 30 miles of the Gold Hill mine.—— Track laying on the Western Pacific west from Salt Lake is progressing. Nearly all the grading is done for 100 miles out of Salt Lake City.

The Bingham Mines Co., recently organized to operate a group of claims near the Boston Consolidated properties in Bingham, will be under the management of D. C. Jackling of Salt Lake.—— The management of the Fortuna mine, at Bingham, has decided to build a tramway to facilitate handling of ore. The line will be about three-quarters of a mile long. It is likely that the rail system will be used with electric motors.—— The York, Petro, Highland Boy Consolidated, and Red Wing companies, at Bingham, are to be disincorporated, and special meetings of shareholders have been called for July 20. These companies are now controlled by the Utah Apex and Utah Development companies.—— Lafayette Hanchett, general manager of the Boston Consolidated Mining Co., at Bingham, last week let a contract for 286 Wilfley tables for the company's Garfield mill. The plant will also contain 254 Johnston machines. On June 22, one of the steam-shovels ordered for the mine began operations, stripping the ore. This work will be continued until the mill is ready, early in 1907. The shovel will move 3,000 tons of earth daily. This is the second shovel used for mining purposes in Bingham.

The Daly-Judge Mining Co. has liquidated all its bonded indebtedness and will begin July with a surplus, it is said, of about $40,000.—— The West Quincy Mining Co., at Park City, is to undertake to prospect the property below the 400 level by means of core-drills.—— The shaft being sunk on the Magnolia-St. Louis property, at Park City, is now down over 300 ft.—— Ore shipments from Park City were reported last week to the amount of 2,080 tons, the shippers and amounts being: Daly-West, 570 tons; Daly-Judge, 564 tons; Daly-Judge (middling), 98 tons; Kearns-Keith, 82 tons; Silver King, 574 tons; Little Bell, 145 tons.

The Carbonate Hill mine, in Morgan county, of which Matt Daugherty of Salt Lake is manager, is shipping 20 tons of ore daily to the smelters. The ore is high in lead and iron, commanding a premium at the smelters. Development during the last week disclosed copper ore in the lower workings of the mine, the first strike of this kind made in that property.

It has been learned from good authority that engineers in the employ of Charles M. Schwab have been examining gold properties in the vicinity of Marysvale, Utah.

The directors of the Utah Consolidated Co. of Bingham, have posted a dividend of $750,000—$2.50 per share.

MINING SUMMARY

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—The feature of the week has been the consolidation of the Bonanza Circle companies (excepting the Calumet & Arizona) under the name of the Superior & Pittsburg Copper Co. The companies consolidated were: the Calumet & Pittsburg, the Pittsburg & Duluth, the Lake Superior & Pittsburg, and the Junction. There will be some delay in putting the new stock on the market, because the stock in the old companies was widely distributed. As the result of the consolidation, operations will be carried forward on an enlarged scale. The Copper Queen smelter is being overhauled and enlarged. When completed, the smelter will have eight blast-furnaces. There is some talk of building three or four reverberatory furnaces, but no definite steps have been taken in this direction as yet. The output from the smelter this month will be 8,000,000 lb. copper. The enlargement of the Calumet & Arizona smelter is going steadily forward. The output this month will be 5,000,000 lb. copper. A new hoist has been installed at the Oliver shaft. At the Shattuck property on Wednesday, a large body of high-grade oxide and carbonate ore was opened up on the 600 level. Drifts on the 500 and 700 levels are all in ore. Stoping will begin simultaneously in all three levels next week. The Shattuck people will not build a smelter at present but wil continue shipping to the Copper Queen smelter. At the Denn-Arizona the drift is being pushed north and south on the 1,000 level. Outside of the find, about ten days ago, nothing notable has developed. Preparations are being made to start sinking to the 1,200, on which level the drift will be directed toward the Copper Queen property. Little can be said of the progress at the Cochise, except that they are gradually working toward the Copper Queen on the north. It is conceded that they will drift into the extension of the big orebody encountered by the Copper Queen, in the 1,200 level of the Czar shaft. During the early part of the week the diamond-drills of the Warren Development Co. passed through the conglomerate and entered limestone formation. The shaft on the Chicago claim has been sunk to a depth of 60 ft., and machinery has been installed to continue sinking.—— At Tombstone the old water trouble is still occupying the centre of the stage. The company has installed two more new 200-h.p. boilers, making a total of seven 200-h.p. boilers and two smaller ones. With these they expect to take out the water, so that sinking can be continued. Regular shipments are being made from the Toughnut, Silver Thread, and Lucky Cuss shafts. At the mill 30 stamps are dropping and as soon as the water can be controlled, the other 10 will be put to work. The concentrate is still shipped to the smelters at El Paso. The expense of treatment has been reduced from $1.50 to $1 per ton.—— Contrary to all expectations, development work in the Chiricahua district has not opened up ore. The operations have been carried on by the Chiricahua Development Co., and it seems that its methods have resulted in a comedy of errors from start to finish. The consensus of opinion among mining men of this district is, that when the option expires September 10, it ought to step out of the way and let men who understand mining take hold of that property: otherwise a good district will be condemned on account of poor management.—— The old Exposed Reef property in the Huachuca mountains has passed into the hands of the Elwell Mining Co. There was a great deal of friction among the stockholders of the old company, which has happily led to the transfer. This is a gold property and has always given promise of being a mine if properly handled. Stocks in this district have been holding up very well in spite of the summer season.

Bisbee, June 23.

At the Shattuck-Arizona mine at Bisbee, last week, while cutting the station on the 600-ft. level, near the shaft a fine orebody was encountered. Ore has now been found on the Shattuck on the 500, 600 and 700 levels. Most of the development has been done on the 700. The pumps are working night and day, lowering the water in the shaft. At the 800 level drifting will be resumed. Regular shipments to the Copper Queen smelter, at Douglas, over the tramway will be commenced in August, and Shattuck-Arizona will become a steady producer within two years after the development work was begun.

GILA COUNTY.

(Special Correspondence).—Mr. Palmer, president of the Shannon Copper Co., who has been in Clifton the past few weeks, left for his home in New York the first

of the week.—A franchise was granted last week by the board of supervisors of Graham county for the construction and operation of the electric line from Clifton, Morenci and Solomonville, the franchise to run for 99 years. It is the intention of the promoters to construct the Clifton-Morenci line first and then extend it to Solomonville, Safford, Thatcher and other Gila valley towns, in this county. The reduction of freight rates from the Gila valley to the mountain mining towns will surely follow. — The incline of the Shannon Copper Co., at Metcalf, was greatly damaged by fire on Wednesday night, June 13, and at one time the whole structure was seriously threatened. The manner in which the fire started is not known, but it is believed to have been caused by a lighted cigarette dropped by one of the workmen.—The weather has been so dry that the timbers of the structure were like tinder, and the fire had made much headway before it was discovered, burning the hoisting apparatus at the top of the incline. The incline was so badly damaged that no ore can be handled over it for a week or 10 days, and with the exception of a little in the bins, no ore is available for the furnaces at Clifton.—Silas Starrett and Dan McKay have taken the contract to deliver the machinery for the Santa Rosa group at Coronado. The contractors have made a mountain cart, employing in its construction the solid iron wheels taken from the slag pots, and connecting them by 6 by 8 timbers. They expect to get the machinery into position without much trouble, although the road is steep. The Santa Rosa group is the property of the Detroit Copper Mining Co. and the work of development has shown such good results that improved drilling is being installed.

Clifton, June 23.

YAVAPAI COUNTY.

A new strike of gold and copper ore has been made in the Senator mine, in the Hassayampa district 15 miles from Prescott. This strike was made at the end of the adit on the Senator property, now in over 2,800 ft. and run to cross-cut the formation, including the veins worked in the old mine. The new find is a four-foot vein carrying gold and copper assaying $50 per ton.

CALIFORNIA.

AMADOR COUNTY.

In the issue of June 16 a report from Sutter Creek was published to the effect that the Keystone mine, one of the largest and most noted mines of California, had been sold to the Bagdad-Chase Gold Mining Co., of New York. Further inquiry, made since the publication above referred to, elicits the information that the report, though premature in announcement, was nevertheless based on fact. For several months past George W. Myers, of Berkeley, has been negotiating with the prospective buyers for the transfer of the Keystone property, acting for the owner, M. J. McDonald, of San Francisco. The Bagdad-Chase Gold Mining Co. is already largely interested in California, owning the noted mines near Ludlow, at Camp Rochester in San Bernardino county, and operating the Soulsby mine, at Soulsbyville in Tuolumne county. Should the Keystone mine pass to the ownership of this company, it will be more fully equipped and operated in a more vigorous manner than at any time in its history. The Keystone has been worked almost continuously for more than 50 years and is credited with a production exceeding $16,000,000, the greater portion of which has been mined above the 700-level. Below that level the mine is still nearly intact, little having been done beyond development, the operators having long since concluded, that as the upper levels would supply all the ore the mill could handle, it was useless to draw on the reserves at greater depth until it became necessary.

BUTTE COUNTY.

C. L. Wilson, representing a Los Angeles company, is operating a quartz vein on the Pieper ranch, near Forbestown. From a 50-ft. shaft, drifts have been driven on a vein two to six feet wide that shows gold, and is said to sample $50 per ton.—Near Robinson's mills an arastra is being constructed to grind ore from a vein on the Tompkins ranch. The vein is 18 in. to 4 ft. wide and rich in gold.—The McNair mine, owned by L. A. Russell, is near the Tompkins ranch. It has produced several thousand dollars, mostly from pockets.—The Phoenix mine, near Hurleton, which has been idle for some time, is to be reopened, according to local report.—The North Star mine is reported under bond to J. H. Thomas, who intends to operate it. There are several veins in the North Star property, and some of the ore is of good grade.

CALAVERAS COUNTY.

At Mokelumne Hill, J. J. McSorley began prospecting early in June for a quartz vein supposed to exist in French hill, less than a mile from town. McSorley and New York associates recently purchased 40 acres of ground covering French hill, and last week the miners uncovered a vein of quartz two feet thick that will mill $100 per ton.

The overturning of a freight car of a train running on the Sierra railway between Jamestown and Angels on June 26 exploded a ton and a half of dynamite and killed two brakemen, Hoagland and Brown. The car carrying the dynamite jumped the track on a curve, and was completely destroyed, parts of the wheels being thrown a mile and a half. The chlorination works at the Carson Creek mine were wrecked by the explosion, which was felt at Stockton, 60 miles away. The dynamite was for use in the mines at Angels.

KERN COUNTY.

(Special Correspondence.)—The tungsten mine near Randsburg is operating and shipping the ore. At first the tungsten mineral (scheelite) was found only in detached boulders; now the vein from which these fragments come has been found. It is reported here that $27,000 has been paid on the purchase price, which is $100,000, and after paying all expenses, the owners have over $25,000 in the treasury, all from the proceeds of operation.

Randsburg, June 23.

LOS ANGELES COUNTY.

The Lowell & California Mining Co., operating the Big Horn mine on North Baldy mountain in the San Gabriel range, 50 miles northeast of Los Angeles, is to build a 60-stamp mill. This property was first equipped with a two-stamp mill and later ten stamps were put in. The extensive development of ore reserves has made a large increase in milling facilities desirable. There are numerous mineralized zones in the schists of these mountains, but few of them have been developed.

MARIPOSA.

(Special Correspondence.)—The Mount Gaines mine, five miles east of Hornitos, is successfully operating after the various vicissitudes which even good mines sometimes experience. It was first worked about 1895, but in its early history the gold was found much scattered, and it was generally considered a pocket mine in many ways similar to the numerous other pocket mines of the vicinity of Hornitos. There was, however, a good deal of low-grade ore in the vein, which was mined by the operators at that time. As the proposition proved unprofitable, work was discontinued and the mine remained idle until about a year ago, when the water was removed from the workings, and examination showed that the soft, slaty material inclosing the lenses of quartz contained as much gold as the quartz itself, and could be worked at a profit. The mine was formerly equipped with a hoist and 10-stamp mill, which had been removed. Two Huntington mills, each operated by a separate gas engine, and a steam hoist were installed. An examination of the filling, which comprised the slaty material mined by the old management, was made, and it was found that it also contained good pay. The management is now successfully mining a vein 4 to 12 ft. wide, sending everything between the walls to mill; in addition to which some selected high-grade sulphide ore is shipped. The Huntington mills are to be replaced by 20 stamps.—The Exchequer mine, near Merced canyon, eight miles northeast of Hornitos, the old Quartz Mountain mine, two miles south of Hornitos, the Grimshaw, between the Exchequer and Mount Gaines, and the Organita, east of Quartz mountain, are all either working or about to resume. The deepest mine in the district is the Washington, two miles northeast of Hornitos. That mine is 1,500 ft. deep and produced $2,000,000. It has been idle many years.

Hornitos, June 24.

MONO COUNTY.

McCord & Lorendo have completed their one-stamp mill, and will commence crushing ore July 10. Their property is situated on old Mono Diggings, which in the early days of Mono county netted the owners large profits.—The hoisting plant, formerly used on the mining property at Sigourney Flat, just south of Bodie, has been torn down and removed to the Midnight mine bonded by Denver capitalists. Two shifts, including 25 men, are employed in development.

W. B. Searles, engineer of the Bodie Mining Co. is at Sweetwater, Nev., and has begun preliminary work on the erection of an electric station that is to generate electric power for Bodie, Aurora and Masonic. The station is to be built on the east Walker river and will cost over $100,000. Reed Smoot of Salt Lake and J. R. Twelves, of Provo, are interested in the company. The company's heaviest investment is in mines in Bodie and Masonic districts. Several years ago the stockholders purchased several groups at Bodie and afterward took over the Syndicate mine. They will use the adit and other workings of this old company to develop their adjoining claims. There is a large mill and cyaniding plant on the property. The company also took over the Jump-up-Joe mine in the Masonic country, which is now being developed.

SIERRA COUNTY.

Two or three miles from Boca boring for coal is in progress. It is claimed that for the past 30 years it has been known that there were evidences of coal, but it is only recently that boring for it began.—At Washington, the Giant King mine is to be opened. W. L. Williamson has gone to Washington to arrange for starting the lower adit. The mine has been sampled and eastern people are backing the enterprise. The Giant King has probably the largest vein in the county. It varies from 70 to 90 ft. in width and mill tests have returned $4 per ton. The lower adit taps the vein at a depth of 100 ft., and at that point better values have been encountered. Where the new adit will be started the natural slope of the ground is such that a mill can easily be erected.—At Steep Hollow mine, above Nevada City, a company, headed by J. W. Jaquath, has a number of claims through which an ancient river channel is known to extend. To determine its exact length and width, as well as the amount of gold contained in the gravel, the company is arranging to prospect the ground with a drill. Holes will be sunk at regular intervals, and the gravel carefully washed. Adjoining ground is being worked at a profit and it is seen the channel runs into the ground controlled by Jaquath and his associates.

SHASTA COUNTY.

The Brunswick mine, situated near the Trinity county line between Deadwood and French Gulch, was sold last week by Francisco B. Rossi to H. D. Lacey, of New York, for $60,000. Several large veins have been opened up. The new owner will erect a 10-stamp mill on the property and will drive an adit to the ledge 300 ft. lower than the present workings. In the early '80s the Brunswick was worked by the Brunswick Mine & Milling Company.

TRINITY COUNTY.

At the Bonanza King mine 175 men are employed, some building roads, others digging ditches, and a good crew are in the mine. Machinery for the mill is arriving daily. An aerial tramway a mile and a half long is in course of construction. An electric line from the east fork of Trinity river is being built. The mill and all works will be operated by electricity. The property is owned by Treadwell brothers of San Francisco.—The Sykes gravel mine at Trinity Center employs 30 men. There is plenty of water and a large amount of dirt is being moved.—At Snowslide gulch, near Carrville, R. G. Abrams is working a small placer mine. The gravel prospects well and the owner expects good results from the season's run.—The Strode brothers are getting ready to start their mill on the Oro Grande. The long spell of wet weather has made operations late at this mill.—At the Golden Jubilee, on Coffee creek, ten men are taking out ore and the mill is running.—At the Nash gravel mine 15 men are employed. The water supply is good, ground is being moved rapidly and a big clean-up is assured. William Maitland is the superintendent.—At the Dorleska, development work is in progress.—Many other small mines are being worked and much prospecting going on both for quartz and gravel.

TUOLUMNE COUNTY.

The Hunter mill near Buchanan is to run on ore from the Hardtack mine.—At the Spring gulch, south of Carters, the owners are installing a rock breaker, new concentrator and two 3-stamp mills. The concrete foundations for this machinery were built several years ago by H. J. Sisty.—The Keltze mine, situated ten miles north of Soulsbyville, overlooking the Stanislaus canyon, has been bonded by an eastern company. Ten men have been put to work.—Operations have been commenced at the Uncle Sam mine near Arastraville.

COLORADO.

DOLORES COUNTY.

At Rico the Hicks & Mylcram lease on the Smuggler is piling up a good grade of ore preparatory to shipment.—— The Herron & Wold lease on the Yellow Jacket has opened up a fine body of lead-zinc ore.—— Charles Rohde is running a new adit on his Lillie D. claim to cut the orebody.—— Merrifield & Campbell, lessees on the Syndicate, are running their concentrator continuously and making a good grade of concentrate.

LAKE COUNTY.

The Triangle Mining Co., in Leadville district, has secured a long and favorable lease on the Badger, Lady Alice and Triangle claims and some fractions belonging to the Gaff estate, situated on the east side of Adelaide park. Several years ago the owner did considerable work on the Lady Alice and Badger claims, sinking the Badger shaft 900 ft. and the Lady Alice to 300 ft. Numerous drifts were run on both claims and some good

ore found. With the death of the owner work was suspended and the properties have been idle for years. It is the intention of the company to work the Badger shaft alone for the time being. After the shaft is put in proper shape and machinery is installed, exploration will be carried on from the bottom of the shaft to find the orebodies. With the unwatering of the down-town mines, the water problem in Adelaide park, to a great extent, has been solved, so the new company will have no trouble from this source.

In the Twin Lakes district, electric and steam plants are to be installed, and two mills will be built this summer. One is being erected by Harrison, Robinson and others, of Leadville, at the base of Champion mountain, at Lackawanna, in a gulch near the summit of the Continental divide. Notwithstanding the rich ore found in the district, its development has been retarded by high altitude and difficulties of transportation. Better weather conditions have inaugurated an era of activity in this part of the district. Several four-horse teams loaded with a crusher and other machinery went there last week, the old Bromley mill has been purchased and will be moved soon, and another mill was taken in last fall, and these will be combined to make an up-to-date plant.—At the Miller mine the owners have opened up a four-foot vein from which several shipments have been made. Adjoining the Miller, lies the Dick Turpin, from which several thousand tons of float have been shipped. This claim is owned by Tingley S. Wood, of Leadville, and forms a part of his Theodolite group, extending into Half Moon gulch. Several other valuable properties have been located on Champion mountain. The Champion mine has shipped ore that returned $1,500 per ton.—The High FallsMining & Power Co.'s property, the McDonough and Lackawanna Boy claims, covers 3,000 ft. of one of the largest veins in the district. With better roads and mining facilities, this locality can be made a producing camp.

SAN JUAN COUNTY.

(Special Correspondence.)—Work is starting on the Gold Prince mill. Men for putting up the steel work are on the way and machinery is being sent in by the Denver Engineering Works Co. of Denver, who are supplying the material. Work will be pushed as rapidly as possible until completed. This mill was started last summer, but on account of the early snows last fall the railroad was unable to handle the material and work was suspended until this summer. The railroad now extends from Silverton, the terminus of the Denver & Rio Grande, to Animas Forks.

Animas Forks, June 23.

SAN MIGUEL COUNTY.

The Tomboy Mine Co.'s 60-stamp mill is undergoing repairs which will increase its efficiency. The old batteries are being replaced by new ones. While this work is in progress 10 stamps at a time are hung up. Among other improvements is a set of new bumping tables. The coal sheds at the old mill have been torn out and a compressor house is being built on the site to hold the 11-ton Ingersol-Sergeant compressor. The new machine is an addition and will not replace those heretofore in use. It will supply air for machine drills in use throughout the mine. Several of the Huntingtons in the old mill are running on ore from the McCoy lease on the old Tomboy. The company is milling the ore under the terms of the lease. The Huntingtons have always been used in treating ore from the old Tomboy, while stamps are used on ore from the Argentine or new Tomboy.—Since the heavy snow in March the road to Alta has been closed to wagons or pack trains. Since supplies could not be taken in, most of the force was laid off. The snow is still treacherous, and after a few steps upon the crust a man breaks through and goes down to his middle. He struggles out only to repeat the performance a few steps further along. Between 12 and 15 men have been kept on development and some very good ore-bodies have been opened. J. L. Brown, manager of the Alta Leasing Co., operating the mine, states that as soon as the trails are in good condition shipping ore will be packed down the railroad.

S. L. Fulkerson, manager of the Pandora Gold Mining Milling & Development Co., says work on the wire-rope tramway from the portal of the main working adit on the Pandora lease to the upper terminal of the new Smuggler-Union tramway, at the mouth of the Pennsylvania adit, will soon commence. When this system of transportation is established the large quantities of low and medium-grade ore in the bins at the mouth of the adit will be sent down to the Pandora 80-stamp mill. The company recently made a shipment of high-grade ore to a smelter. It is the intention to make regular shipments of high-grade ore. Some ore of this class runs as high as 50 oz. gold and nearly 200 oz. silver per ton. The vein is six to ten feet wide; the greater portion is heavily mineralized. Work in the lower, or French, adit is being prosecuted. At a proper point a raise will be driven to the adit above, 250 ft. The Pandora property is owned by the Smuggler-Union Mining Co., and the operators have a lease for several years.

SUMMIT COUNTY.

(Special Correspondence).—The principal shipping mines of Breckenridge district are keeping teams hauling to the Colorado & Southern Railroad and giving the town a busy aspect. The shipping list includes the Old Union, Wellington, Lucky, Country Boy, Sallie Barber and Bullion King. The mills sending out concentrate are: the Old Union, Lucky, Jessie and Minnie. The Country Boy will also figure in this list shortly.—The Wire Patch mine is showing unusual activity. Mr. Putner has a large force getting the remodeled mill into shape. Two new 60-h.p. boilers are being built in. Thirty men are working constantly and more are to be put into the mine. — The Lucky and Minnie combination is employing a large force in both mines, and work is being done in ore.—The Laurium mine on Mount Baldy, owned by the Blue Flag Gold Mining Co., under managment of Robert Niles, is to be worked on a larger scale and the mill will be enlarged to treat four times its former capacity. This mine has now several thousand tons of ore blocked out.—The owners of the Atlantic mine on North Star mountain, having decided that they were sustaining too large a loss in shipping high-grade gold ore to the smelters, have taken a long lease and option on the milling plants at Montgomery camp at the foot of Hoosier pass on the Alma side of the range, and are getting the mills in order for immediate work. The mill is provided with concentrators and a cyanide plant, and some experimenting will be done to determine the best method of handling the ore. This mine is producing large quantities of ore averaging from 3 to 5 oz. gold per ton and at times makes shipments of 10 to 15-oz. ore.—The Jessie Gold Mines Co.'s 40-stamp mill is working day and night and a big clean-up is expected.—The Reliance dredge in French gulch is credited with a daily clean-up of $1,000, at which rate the company will soon have the dredger paid for and begin the distribution of dividends.—A party of officers and stockholders in the Square Deal Mining & Development Co., operating at Frisco, arrived the latter part of the week and are taking a general look around the camp. The management has started the camp and workings in North Ten Mile canyon and the main adit in Chief mountain is now in 75 ft. A commodious boarding-house, office, bunk-house and blacksmith-shop have been built. The visiting party consisted of Frank E. Wire, president, W. W. Wonser, sercretary, F. N. Giddings, director, and several shareholders.

Breckenridge, June 23.

TELLER COUNTY.

Richard Blanchard, superintendent of the Metallic Gold Mining Co., leasing on the Bill Nye claim on the south slope of Copper mountain, in Cripple Creek district, has made a strike on the 185-ft. level, 100 ft. north and east of the shaft, where he broke into a vein 2½ ft. wide. Assays of the screenings run over $100 per ton. The ore shows free gold and sylvanite.

IDAHO.

LATAH COUNTY.

The discovery of rubies and sapphires, on the McGary ranch near Hendrick, is reported.

NEZ PERCE COUNTY.

Frank T. Barnard describes a vein at Peck, where he inspected the croppings, which attracted much attention several weeks ago. He says the gold occurs in limestone which is about 15 ft. wide. The limestone is pure and can be used as flux for silicious ore at the smelters. Parallel with the lime runs a quartz vein which in places contains gold.

SHOSHONE COUNTY.

According to a reported statement of E. H. Moffitt, manager of the Star Mining Co., the property of which adjoins the Morning mine at Mullan, a compressor for the prospect will probably be in operation by July 1. The adit is in 300 ft. and is being driven by hand at the rate of 65 ft. per month. With the installation of the compressor, hand work will be discontinued and three shifts with machine-drills will supplant the hammers.—It is reported that F. A. Heinze has bought the Stewart mine for $400,000.—A deal has been closed at Mullan whereby A. M. Strode's interest in the Reindeer Copper-Gold Co. has been sold to McRae, Keys, et al. of Mullan. The new owners of the controlling interest have assumed the management. The Reindeer group consists of six claims about three and a half miles east from Mullan not far from the "S" bridge on the Northern Pacific's Coeur d'Alene branch. Development is being rapidly pushed.

WASHINGTON COUNTY.

C. F. Drake, president and general manager of the Hancock Copper Mines Co. near Ladore, says of the Seven Devils district, that there is activity on all sides which will be increased as the season advances. From the Queen mine high-grade ore is being hauled to Council and shipped to the Sumpter smelter.—On the Humboldt property owned by the Hancock Co., Mr. Drake states that the adit is in 400 ft. and is being driven ahead in a body of good grade ore. Ten teams are hauling ore from the mines to Council for shipment to Sumpter. Hauling costs $9 to $11 per ton. It is impossible to procure sufficient teams to supply the demand.

MICHIGAN.

HOUGHTON COUNTY.

The question of disposing of the waste sand, which must eventually be met and solved by every stamp-mill in the Lake Superior region, is to be worked out along new lines by the Mohawk, and as necessity demands by the other Stanton companies. The method to be applied is the invention of J. F. Jackson, who has had it under consideration for some time. It was accepted by the Stanton management only within the last few days. The only stamp-mill at the lake now using mechanical means to dispose of its waste sands is the Calumet & Hecla, where tailing wheels, from 40 to over 60 ft. diam., with buckets in the inner periphery of their rims, elevate the material to their respective heights and discharge it into launders through which it flows by gravity the necessary distance out over former accumulations and into the lake. This method has been used in times past by other mills, particularly the Franklin, which at one time had three stages, or relays, in order to get the sand out a sufficient distance. But because of the removal of all the mills to new places during the last 10 or 15 years, with deeper water and more sand room, the problem has not presented itself recently until now the Mohawk is taking it up. The Atlantic was spared the necessity of taking action by reason of two or three violent storms which washed out a large portion of the sand accumulation into Lake Superior. The Atlantic also discharges its sand from the upper jigs as far as possible at that level instead of permitting them to flow down to the common level of the lower portion of the concentrating floor, and thus it has a longer flow through the launder, which helps materially in adding to the distance which the sands may be carried from the mill by gravity. The new method worked out by Mr. Jackson has as its prime feature of economy the separation of the water from the sand, after which the water will flow by gravity, but at a much flatter incline than when it carries the sand with it. The sand will then be lifted on an endless belt elevator to a hopper directly above the water launder and will be carried then by a belt conveyor that will extend the full length of the water launder and immediately over it. When the end of the launder is reached the mechanically conveyed sand will be discharged into the water just as the latter flows over the lip of the launder and will thus be spread out and diffused in the same manner as if it had been conveyed the entire distance by the water. The elevator and conveyor will be operated by electric motors. In the stamp-mill about 30 tons of water are mixed with every ton of sand, consequently when the entire mixture is elevated, as in a sand wheel, 30 times more weight must be lifted than when the sand alone is elevated. By the new method it is only necessary to elevate the sand a short distance, bringing it just above the water launder. Operating against these economies there is, of course, the cost of conveying the sand mechanically the entire length over the water launder, but it is expected that a material net gain will accrue over the handling of both sand and water mechanically. It is planned to cover the equipment in order that it may be protected against freezing. Exhaust steam pipes will also extend through it for the same purpose.

MONTANA.

MADISON COUNTY.

On June 26 near Virginia City, Dan Carroll, formerly a Butte miner, attempted to thaw 70 sticks of dynamite in a blacksmith forge. Carroll's head and arms were blown off, the body being hurled through the roof of the shop and landing on the slope of a hill 60 ft. away. The blacksmith-shop and machine shop were totally wrecked, the damage being estimated at about $2,000.

NEVADA.

ESMERALDA COUNTY.

It is reported that Mattly & Clayton have struck good rock on their lease. The shaft is down 175 ft. A ledge was cut during the sinking of this shaft, from which an average assay of $300 per ton was taken.

HUMBOLDT COUNTY.

The Lone Mountain Co., owner of the Humboldt Queen, have let a contract for a 200-ft. shaft to be sunk 180 ft. south from the old workings. John Borland has the contract. The shaft will be sunk to strike the body of ore which, by surveys of the lower workings and surface croppings, it is thought will be found.—In the beginning of this work, Mr. Sims, superintendent, is starting extensive improvements on the Humboldt Queen.

LINCOLN COUNTY.

(Special Correspondence.)—Railroad companies are racing in construction across the desert in southern Nevada to reach the traffic offered them. Several years ago building was commenced on a road from Caliente to Pioche but for some reason the project was abandoned and it remained for the San Pedro, Los Angeles & Salt Lake road to see the future of such an enterprise and take up the matter where it had been left off. Surveying and grading is going on and will be followed by the laying of rails.—— Under the direction of the Searchlight Light & Power Co., engineers are surveying the Searchlight streets, followed by workmen making necessary preparations for installing a new electric light and power plant. The work will be completed not later than September 1.—— L. E. Bamberger, of Salt Lake, is visiting Searchlight this week, inspecting mines of the district.—— A rich body of ore has been opened up in the New Year's Gift shaft of the Duplex mine. The superintendent states that it is shipping ore from top to bottom.—— An extra force of men has been put to work on the Searchlight-Diamond property, opening up another vein that has given good 'hornings' from the grass roots across its entire width. This makes the third shaft now being sunk on this property.—— Vigorous exploration of Crescent properties is bringing high-grade ore to light.—— A new gasoline hoist has been installed on the property of the Lucky Dutchman and a large force put to work sinking for the 300-ft. level.—— The 150-ft. shaft of the Nippeno mine is being sunk deeper. Large quantities of good ore have already been taken from the upper levels, and are on the dump awaiting the mill which the company will build as soon as enough water is developed.—— Three shifts are sinking a shaft on the Big Reef property; the samples taken from the vein which they have opened up are said to run from $45 to $200 per ton.—— In El Dorado and Nob Hill districts, the Capitol group, owned by Monoghan & Murphy, of Needles, has been bonded to G. F. Colton, who with his associates will continue development.—— The Philadelphia group, at Nob Hill, has been bonded by the owners to Wisner, Ward & Co., of New York, for $15,000.

Searchlight, June 23.

NYE COUNTY.

The Minnie May No. 1 lease on the south end of the Johnnie Consolidated Gold Mining Co.'s property at Johnnie, has made another strike and ore is being sacked for shipment. Two weeks ago the first rich strike was made.—— The Bullfrog-Johnnie Co. is preparing to open its property, which is situated southwest of the Johnnie Consolidated Gold Mining Co.'s property. Pipe has been ordered for the completion of a new water system in Johnnie which will be laid on arrival.

STOREY COUNTY.

Work has been resumed in all the Gold Hill mines after a shut down beginning just after the San Francisco disaster, and on the Comstock the mines will be opened with their regular working forces on July 1.

WASHOE COUNTY.

(Special Correspondence.)—The Green-Hill Mines Corporation, operating in the White Horse mining district, has let a contract for grading the railroad between Olinghouse and the mill-site on the Truckee river, and work has been commenced. The mill-site is also being graded. The property of this company is being opened up by cross-cut adits, and drifts in ore.—The Slip mill is running on ore from the Renegade mine which has been leased by Joseph Effricks and associates.—The Springfield-Nevada Corporation has resumed work on its property. A contract has been let to drift 500 ft. on the main adit and work has commenced.—Another strike has been made on the property of the Texas-Nevada Co. in the main north drift, on the 100-ft. level, which has been advanced 250 ft. The vein fills the full width of the drift, and is rich, six inches of it assaying $1,000 per ton gold.—The Keystone-Nevada is working an increased force of men. Rich ore is being taken out. Ore-bins are being built and the mill will be in operation before the close of the present year.—The Ohio-Nevada Co. is sinking a shaft on the Standard claim which it recently purchased.—A cross-cut adit on the Belcher property has been advanced 100 ft.—The owners of the Jim Blaine report a rich strike 125 ft. east of the old shaft on this claim.—The Fern-Cliff Co. has prospected its property on White Horse mountain, and will sink a shaft on the vein that runs through the Valley View No. 1 claim.—The shaft on the Mid-West property, in Jones canyon, has been sunk on the Mormon vein, from which rich ore has been sacked.—The adit on the Optimus group of claims has cut five parallel veins in 155 ft., and opened up what seems to be a permanent water supply. This adit will be continued 1,000 ft., cross-cutting the formation, and tapping the water supply in Olinghouse ravine, for milling purposes.—The Wolverine-Nevada Co. has acquired six or more claims, in section 16, and is preparing to develop the property.—The Jessie M. claim has been sold to a company in Columbus, Ohio, for $20,000. This claim was partially developed by the former owners who uncovered a body of rich ore.

Olinghouse, June 21.

Construction of the Wadsworth-Olinghouse railroad has commenced and 85 horses and 50 men are grading the road-bed. This force is to be increased and those in charge say the road will be completed within 90 days. The road will extend from Wadsworth spur at a point near the Monte ranch and extend to the mouth of Olinghouse canyon, where it will connect with the various mines by a system of tramways.—Near the Monte ranch will also be built a 50-stamp mill for the reduction of Olinghouse ore. It is said to be the intention to make this plant one of the largest in the West and bid for the business of Tonopah, Goldfield and other southern camps.

OREGON.

BAKER COUNTY.

(Special Correspondence.)—Two railroads are simultaneously building toward the Copper range in the district east of Baker City. One is approaching from Snake river near Huntington down to the Iron Dike mine at Homestead. The other is coming in from the west, and construction of a road up Catherine creek from Union is under way. Among recent visitors to the Cooper district were W. P. Harlow, E. J. Collins, and R. D. George of the University of Colorado.—It is reported that Cox and Jennings have bonded their property, on Goose Creek, to Los Angeles capitalists.—John E. Searls, of New York, is at his mine in Cornucopia district, situated at the head of Pine creek, near the foot of the Eagle mountains, and 50 miles northeast of Baker City. It is intended to increase the capacity of the plant by adding twenty stamps and a cyanide plant. He has let contracts for separate cottages, to supplant the bunk and boarding-house system, and encourage the permanent location of men with families. Exhaust steam from the boilers will be utilized to heat the cottages; and the company has its own electric lighting plant.—About seven miles northeast of Baker City is the old Flagstaff mine, which for a number of years has been idle. It was owned by a French syndicate. Last week, Emmett Callahan, of Baker City, took over the property for Boston men and deposited in bank the first payment of $25,000.—E. I. Fields, manager of the Baisley Elkhorn mine, is exhibiting ore from that property that assays 20 % copper and $80 gold per ton. There are 100 men employed at this mine.—Not far from the Baisley-Elkhorn, and near to the Nelson placers, a company from Mattoon, Ill., is developing a vein of free-milling gold ore. Much of it is high grade. Contracts have been let for a mill, by A. W. Butler, manager.—On Rock creek, which runs into Powder river valley on the same side of the mountain, with the two properties last mentioned, a prospect was recently sold in Spokane.—At Timber canyon, the company operating there has men running out ore from a four-foot vein, sorting it into two dumps, one averaging $6 and the other about $150 gold per ton.—On the Sumpter side of the range, where most of the gold producers are situated, the mines are running on full time, and several new strikes are reported.

Baker City, June 25.

UTAH.

JUAB COUNTY.

An important strike is reported on the 1,300-ft. level of the Mammoth mine in Tintic district. This ore, which carries sufficient gold to make it high grade, was opened up some time ago upon the 1,600-ft. level and there is now 300 ft. of stoping ground available; although the main shaft is not being deepened at present, another shaft is being put down from the 2,100 level. This shaft, or winze, is now nearing the 2,200-ft. level and it is likely that sinking will be continued until the 2,500-ft. level is reached.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Pearl Consolidated Mining Co. has closed down, the contract having run out and there being no present market for the ore. Samples have been sent to Denver, and if a suitable method can be found, a mill may be built.—The San Poil Gold Mining Co. has leased the upper workings of the San Poil mine to W. M. Crummer, the former superintendent.—A. C. Cook, formerly superintendent at the Mountain Lion mine, is now superintendent of the Anonymous mine, and is making necessary changes. A number of test-pits have been sunk, and ore found below the oxidized zone, which assays well.—The No. 1 adit broke into the vein, when in 65 ft., through the hanging wall. The No. 2 adit is in 265 ft.

Republic, June 20.

STEVENS COUNTY.

(Special Correspondence).—The Napoleon adit is in ore which assays well in gold and copper. The main adit is in over 400 ft. On the 60-ft. level a cross-cut of 120 ft. is all in ore which has been driven on 173 ft. A wagon road will be built between the mine and Kettle river bridge at Orient.—In the First Thought mine, above the adit-level, a chamber has been excavated, and sinking on the orebody will now be started. The aerial tramway at Silverton, in the Cascade mountains, is being removed to this mine. New quarters are being erected for the men, and the old buildings are being renovated.—R. C. Crowell, has taken a bond on the Young America mine, which produces silver, lead and zinc ore.—The Interstate Co., with a group of 20 claims on the southwest slope of Sunset peak, at the head of Nine Mile creek, is getting ready for extensive operations. A vein five feet wide has been stripped and found to carry gold, silver and copper, and 15% lead.—The Dominion Hill Co. has several claims on a contact from which ore has ben extracted that assays $75 to $100 per ton. A great deal of ore has been taken out through an adit which has developed a number of rich stringers. Beyond those stringers is a reef of quartzite, and further in, a body of good ore, which has not yet been fully crossed by the adit. A raise will be put through to the surface for ventilation, and the company will now employ an additional shift.

Orient, June 20.

BRITISH COLUMBIA.

The profits of the Le Roi mine at Rossland for May reached $50,000. This mine has made a profit of from $30,000 to $50,000 for every month of the present year, and Le Roi No. 2 is making larger profits than ever before in its history.—Following are the shipments for the past week: Centre Star, 2,250 tons; Le Roi, 2,790; Le Roi No. 2, 510; Le Roi No. 2 (milled), 600; Crown Point, 120. Total for the week, 6,270 tons, and for the year, 156,049 tons.—The British Columbia Copper Co. has taken up its option on the Oro Denoro mine at Summit camp. This gives the purchasing corporation another claim adjoining its Emma mine. For the last two months the property has been tested by diamond-drills. The company has also taken an option or working bond on the British Columbia mine at Summit which was held by W. T. Hunter of Greenwood. Men have been sent to the mine to pump it out and prepare it for examination and development. The British Columbia mine was the first shipper of importance in this section when the Canadian Pacific railway was completed from the Columbia river to the Boundary, and much of the copper-gold ore was sent to the Trail smelter. More than 100,000 tons of ore were shipped and then the mine was closed down. It is said that the mine has large bodies of ore that can now be shipped profitably, whereas, in the early days, with high freight rates and smelter charges, and low copper prices, they did not pay to take out. Although the smelting plant of the British Columbia Copper Co. is closed, owing to improvements, the affairs of the company are booming. The Mother Lode mine is being developed under rush orders.—A new compressor building is to be erected on the Emma, near Eholt.—The finest piece of ore seen in Greenwood recently is from the Duncan claim, on the West Fork. The Duncan is under bond to a local syndicate which is developing it. It is near the town of Beaverdell, adjoining the Jolly claim.—More than 600,000 tons of ore have been shipped from Boundary mines and reduced at Boundary smelters so far this year. The figures for the week ending June 23 are: To Granby smelter from Granby mines, 17,313 tons; from Emma, 420 tons; from Skylark, 40 tons; to Dominion Copper smelter from Brooklyn-Stemwinder, 3,135 tons; from Rawhide, 396 tons; from Sunset, 726 tons; from Mountain Rose, 40 tons; to Trail smelter from Providence, 30 tons; from Sally, 20 tons.—Total shipments for week, 22,120 tons. Total shipments for year to date, 601,608 tons.—District smelters treated this week as follows: Granby smelter, 18,393 tons; Dominion Copper Co. smelter, 4,497 tons. Total treatment for week, 22,690 tons. Total treatment for year to date, 611,627 tons.

Personals.

Seeley W. Mudd is in New York.

H. E. West is at Torquay, England.

Henry Brantnober is at Topkouk, Alaska.

Theodore J. Hoover is now at Mexico City.

Newton B. Knox has arrived at Yokohama, Japan.

H. G. V. Adler is on his way from London to Canada.

Charles Butters is on his way to London, via New York.

W. J. Adams has gone to Grass Valley on professional business.

J. L. Marks, of Idaho City, Idaho, is at Silverton, Colorado.

Alexander Burrell is visiting Berkeley, from Helena, Montana.

H. C. Callahan has returned to San Francisco from Australia.

W. H. Truett, of Goldfield, is at the Majestic, San Francisco.

Arthur Thacher has left St. Louis to examine mines in Arizona.

Edgar P. Rathbone has returned to London from Johannesburg.

H. W. Robbins, of Los Angeles, is on his way to Japan and China.

John W. Mercer sailed on June 21 from Montreal for a holiday in Europe.

Curtis M. Lindley is going to Tacoma, where he will work at the smelter.

E. R. Faribault will continue his useful geological work in Nova Scotia.

Joseph Thorn is with the Oriental Consolidated Mining Co., in Korea.

D. C. Jackling is now also manager of the Bingham Mines Co., at Bingham.

O. R. Allen has come from Placerville to San Francisco to buy machinery.

A. C. Cook is superintendent of the Anonymous mine at Republic, Washington.

C. L. Lamoreaux, of Los Angeles, is visiting San Francisco for a few days.

Arthur W. Jenks is manager of the Transvaal Copper Co., at Cumpas, in Sonora, Mexico.

L. E. Bamberger, of Salt Lake, has been inspecting mines in Searchlight district, Nevada.

Joseph B. Tomlinson, of Prescott, Arizona, has gone to Vancouver, B. C., on mining business.

W. A. Prichard has closed his offices in London. His address is now Apartado 1060, Mexico City.

H. Mortimer Lamb is in England, recuperating from his recent illness. He will return to Montreal in July.

R. W. Brock, of the Canadian Geological Survey, is making a further geological study of the Rossland district.

C. Henry Thompson, of the firm of Thompson & Gilliam, has returned to Los Angeles from Durango, Mexico.

William A. Heywood has returned to Butte from advisory work with the North American Co., at Fredericktown, Missouri.

Samuel James is at Colorado Springs, having resigned as superintendent of Los Arcos Mining & Smelting Co., Mexico.

F. L. Johnston has gone to Parmalee, Cochise county, Arizona, to build a stamp-mill for the Huachuca Consolidated Mining Co.

W. H. Whiteside, president of the Allis-Chalmers Co., sailed on June 19 from New York to take several weeks of recreation abroad.

Frederick Lyon, manager of the California properties of the United States Smelter, Refining & Mining Co., was in Salt Lake the past week.

Mark L. Requa is visiting Ely, Minnesota, to see the caving system, in the interest of the Nevada Copper Consolidated Co., of Ely, Nevada.

John S. George, manager of Flower & Co., New York, has returned there after a trip to the Snow Storm Hydraulic Co., at Alma, Colorado.

L. C. Graton will have charge of the collection of copper statistics for the United States Geological Survey after January 1. In the meanwhile he will visit the copper districts of the West.

G. W. Myers has returned to Berkeley from a trip through Amador county visiting the mines along the Mother Lode. He leaves early in July for his annual visit to mines in southeast Alaska.

W. A. Lieblein has been appointed manager of the Salt Lake branch of the Power & Mining Machinery Co., of Milwaukee. W. C. McDowell has been appointed to a similar position for this company at El Paso, Texas.

Books Reviewed.

The Business of Contracting, by Ernest McCullough. This is a little volume on the interesting and highly important matter of contracting. It contains many wise and valuable hints to those in charge of large operations, whether the work is being done under contract or not. There are many things in the handling of men which all who are placed in charge should know, and many of these things can be learned from a perusal of this book. The Technical Book Agency, P. O. Box 691, Chicago, Ill., publishers.

Publications Received.

The United States Geological Survey sends: "The Production of Bromine in 1905," by F. J. H. Merrill, and the "Production of the Lithium Minerals in 1905," by E. O. Hovey. Bulletin No. 280 is on "The Rampart Golr Placer Region, Alaska," by L. M. Prindle and Frank L. Hess. Bulletin No. 282, "Oil Fields of the Texas-Louisiana-Gulf Costal Plain," by N. M. Fenneman; Folios No. 136 of St. Mary's, Maryland-Virginia, and No. 137 of Dover, Deleware-Maryland-New Jersey.

The Copper Deposits of the Robinson Mining District, Nevada, by A. C. Lawson, being a Bulletin of the University of California. It describes in detail the interesting ore deposits of Robinson district, more familiarly known as Ely, which within the past three years has come into notable prominence, and which those who know most of the district believe is destined to become an important factor in the copper production of the world. The geology, petrography and genesis of the ore deposits are gone into with painstaking detail, and it is a classical and valuable contribution to mining geology.

Trade Treatises.

The Chicago Tool Co. has issued special circular No. 56 describing their Duntley air-colored electric drills, portable grinders, blowing and drilling stands.

Bulletin 128 of the **B. F. Sturtevant Co.,** of Hyde Park Mass., is descriptive of their economizers, and Bulletin No. 131, describes their horizontal engines with their interchangeable parts. Both bulletins are, as is usual with their publications, handsomely illustrated.

The Hendrie & Bolthoff Mfg. and Supply Co. have just issued a pamphlet describing and illustrating the Dorr classifier, a new device, constructed on entirely original lines. It is claimed to effect an almost perfect separation of sand and slime. This pamphlet will be sent on application.

'Mine-A-Phones,' is the title of a unique folder sent out by the **Stromberg-Carlson Telephone Manufacturing Co.,** of Rochester, New York. It describes and illustrates their mine telephones, which are rapidly coming into favor in mines. Bulletin No. 19, of this company, is a handsomely illustrated catalogue, describing in detail the installation and usefulness of their mine telephones.

Commercial Paragraphs.

The Crocker-Wheeler Co., of Ampere, New Jersey, reports the recent sale to the Wellman-Seaver-Morgan Co. of three 100-h.p. motors.

Woodin & Little have erected a warehouse and store at 534 and 536 Mission St., between First and Second, where they will have a complete stock of pumps for all purposes, for electric motors, gasoline engines, horsepowers, hand and windmills.

G. W. Myers, of **The Chrome Steel Works,** reports having closed negotiations with the Argonaut, Zeila, and Bunker Hill mining companies to supply chrome steel stamp-mill supplies. He also renewed contracts with the Alaska-Treadwell Gold Mining Co. for chrome steel shoes and stamp-mill parts for the fourth consecutive year.

The Power & Mining Machinery Co., of Milwaukee, recently received an order for 12 sets of 36 by 15 in. crushing rolls and two sets of 54 by 20 in. crushing rolls, for the Utah Copper Co., of Garfield, Utah. The 54 by 20 in. rolls will be the largest of their kind ever built, and constitute an advance order for one of four units of crushing rolls to be installed in the above plant. The rolls are being built in accordance with designs made by Mr. Bradley, consulting engineer for the Utah Copper Company.

Latest Market Reports.

Anglo-American Shares.
Cabled from London.

	June 21. £ s d	June 28. £ s d
Camp Bird	1 5 9	1 4 9
El Oro	1 6 3	1 6 3
Esperanza	3 18 3	3 17 6
Dolores	2 1 3	2 7 6
Oroville Dredging	0 18 0	0 18 3
Stratton's Independence	0 4 6	0 4 6
Tomboy	1 5 0	1 6 3

(By courtesy of W. P. Bonbright & Co., New York.)

METAL PRICES.
By wire from New York.

	Average Prices for Week Ending June 21.	June 28.
Lake	$18.62@$18.80	$18.62@$18.75
Electrolytic	18.37@ 18.55	18.25@ 18.50
Casting	18.12@ 18.25	18.00@ 18.25
Lead	5.75	5.75
Spelter	6.18	6.05
Silver	0.65½	0.65

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 10 Bacon Block, Oakland, has official reports of the following United States patents issued to Pacific Coast inventors:

Patents Issued June 19, 1906.

823,754.—**Saw Swage and Shaper.**—W. Barkla, Spokane, Wash.

824,061.—**Refrigerator.**—L. Borden, Spokane, Wash.

823,913.—**Protective Gate for Moving Pictures.**—L. Bories, San Francisco, Cal.

823,922.—**Garment Supporter.**—C. Chrysler, Los Angeles, Cal.

823,991.—**Water-Gate.**—A. J. Collar, Yreka, Cal.

823,993.—**Portable Wire Fence.**—J. M. Crawford, Crawford, Ore.

823,594.—**Punching Bag Support.**—J. F. Frazee, San Francisco, Cal.

823,595.—**Ball-Bearing Support for Punching Bags.**—J. F. Frazee, San Francisco, Cal.

823,773.—**Bill Delivery Mechanism for Meters.**—R. W. Gallagher, San Francisco, Cal.

824,076.—**Convertible Furniture.**—D. H. Goodrich, Berkeley, Cal.

824,007.—**Riveting Device.**—W. T. Gordon, Juniper, Ore.

824,009.—**Sawing Machine.**—Gray & Horning, Oakland, Cal.

823,857.—**Grinder for Cultivator, Disks and Tools.**—G. B. Greene, Courtland, Cal.

823,723.—**Perpetual Calendar.**—J. Guidinger, Los Angeles, Cal.

824,012.—**Composition of Plaster.**—Harris & Barrick, Los Angeles, Cal.

824,016.—**Poster and Color Printing.**—C. S. Heermance, San Francisco, Cal.

823,864.—**Steam-Boiler.**—F. J. Hickey, Sacramento, Cal.

823,866.—**Oil Burner.**—W. F. Hogan, San Francisco, Cal.

823,865.—**Parallel Ruler.**—I. M. Hofstad, Wrangel, Alaska.

823,533.—**Electric Light Bracket.**—E. F. Hug, Elgin, Ore.

823,872.—**Earth Cutter and Grader.**—D. W. Jones, Sacramento, Cal.

823,883.—**Rotary Valve for Engines.**—F. T. Leggett, North Yakima, Wash.

823,733.—**Kerosene Incandescent Lamp.**—J. A. Mathes, San Diego, Cal.

823,734.—**Kerosene Vapor-Stove.**—J. A. Mathes, San Diego, Cal.

823,802.—**Friction Set.**—M. B. Miner, Sampson, Ore.

823,625.—**Musical Instrument.**—O. H. Newman, Oracle, Arizona Territory.

823,891.—**Trousers Holder and Presser.**—K. Nishimoto, San Francisco, Cal.

824,081.—**Wrench.**—H. L. Reynolds, Seattle, Wash.

824,082.—**Wrench.**—H. L. Reynolds, Seattle, Wash.

823,973.—**Induction Coil.**—S. H. Sauve, Spokane, Wash.

823,814.—**Portable Wardrobe.**—A. M. Schuff, Wells, Nevada.

824,046.—**Electro-Magnet.**—C. F. A. Sturts, San Francisco, Cal.

A trachymeter (rough measure) is described as a theodolite equipped with devices for measuring both vertical and horizontal angles, and also with an arrangement for measuring distance in the telescope.

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WANTED, to go with Reynolds Alaska Development Company, honest educated hustler, who can run men in hard rock; some knowledge of electrical machinery advantageous; salary $200. Address R. N. Cummings, 614 Madison St., Seattle.

WANTED—A first-class assayer and chemist. Nevada Goldfield Reduction Co., Columbia, Nevada.

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WANTED.

I HAVE TWO PROSPECTS, LOCATED NEAR transportation, and where labor is cheap, in which I will give a substantial interest to reliable parties, who will furnish capital to do a small amount of development work. Let me explain the opportunities that Oaxaca offers. References furnished. Chas. Goldsberry, Ocotlan, Oaxaca, Mexico.

WANTED Information as to available deposits of Magnetic Iron. We are owners of special processes for the separation of magnetic iron from Ores, Sands, Shop Wastes, etc.; and wish to correspond with engineers or owners of properties suitable for operations by dredging, mining and milling, and separation by special machinery.
PUGET SOUND METALS COMPANY,
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Own 700 acres; 1100 feet of development work done; need funds to further develop; small amount will prove value of property; to right party a good proposition will be made. Full particulars, including report of expert mining engineer, furnished upon application. Address Box 136, Cedar Rapids, Iowa.

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for half the cost of outfit. Address Assayer, Box 81, Denver, Colorado.

SITUATIONS WANTED

POSITION as mine superintendent; 20 years' experience underground, in gold, silver and lead mines. Ten years' experience as superintendent and foreman. Expert in handling heavy ground. Age 43 years. First class references. Address Box 66, Mining and Scientific Press.

WANTED, a position with a reliable mining company. Have had technical education and six years' experience mining, milling and cyaniding. References furnished. Address Box 67, this office.

POSITION wanted by a practical, first-class all-around mining, mill and smelter man. Wide experience in Mexico and Arizona. Speaks Spanish fluently and can handle Spanish-speaking labor successfully. Location no object; Spanish-speaking countries preferred, however. Al recommendations. Address Box 68, Mining and Scientific Press.

ASSAYER AND CHEMIST wishes position preferably in Arizona or California. Four years experience in West. Best references. Address Box 70 this office.

WANTED—SITUATION as Arsenic Refiner, or where fumes are damaging animal or vegetable life; 20 years' experience. W. Johns, Morenci, Arizona.

CYANIDE ENGINEER, open for immediate engagement; recently mill superintendent in most complete mill and cyadide plant in the West—stamps, re-grinding mills, tables, tube mill, vanners, slimers, sands and slimes plants. This latter is the system devised by Mr. Chas. Butters and is making an extraction of over 96 per cent from slimes worth $20. Have had twelve years' experience with various companies as assayer, amalgamator, cyanide man, master mechanic, foreman and superintendent. Have erected Blaisdell's system of sand excavation. Speak Spanish and accustomed to Mexican ways. Experienced with electro-precipitation for silver ores, and in working out processes for stubborn ores. University of California; 33 years; sober, married. Best of references. Address Box 69, Mining and Scientific Press.

JOB wanted as working superintendent, or foreman of mine. Experienced and thorough. Accustomed to alkali water and a strenuous life. Address Taurus Silex, care of Mining and Scientific Press office, Berkeley, Cal.

MINE superintendent; 12 years' all-around mining; experience in Montana and British Columbia; first-class reference. Surveyor and Assayer. Box 71, this office.

EXPERIENCED cyanide man desires position. Can design and erect mills. Practical chemist and assayer. Graduate of University of California. Address "Cyanide," Box 790, Goldfield, Nev.

COLUMBIA graduate, 1 year's experience, wants position in mining, milling, machinery, engineering, assaying, or as foreman or shift boss. Experience more an object than salary. Address "Mining," care this office.

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DIVIDEND NOTICE.

CALIFORNIA SAFE DEPOSIT AND TRUST CO. Cor. California and Montgomery Sts., San Francisco. For the six months ending June 30, 1906, dividends have been declared on the deposits in the savings department of this company as follows: On term deposits at the rate of 3 6-10 per cent per annum and on ordinary deposits at the rate of 3½ per cent per annum, free of taxes, and payable on and after Monday, July 2, 1906.

J. DALZELL BROWN, Manager.

DIVIDEND NOTICE.

SAN FRANCISCO SAVINGS UNION, NW. Cor. California and Montgomery Sts., San Francisco. For the half year ending 30th June, 1906, a dividend has been declared at the rates per annum of three and two-thirds (3 2-3) per cent on term deposits, and three and one-third (3 1-3) per cent on ordinary deposits, free of taxes, payable on and after Monday, July 2nd, 1906. Depositors are entitled to draw their dividends at any time during the succeeding half year. Dividend not drawn will be added to the deposit account, become a part thereof and earn dividend from July 1st.

LOVELL WHITE, Cashier.

DIVIDEND NOTICE.

GERMAN SAVINGS AND LOAN SOCIETY, 526 California St., San Francisco. For the half year ending June 30, 1906, a dividend has been declared at the rate of three and six-tenths (3 6-10) per cent per annum on all deposits, free of taxes, payable on and after Monday, July 2, 1906. Dividends not called for are added to and bear the same rate of interest as the principal from July 1, 1906.

GEORGE TOURNY, Secretary.

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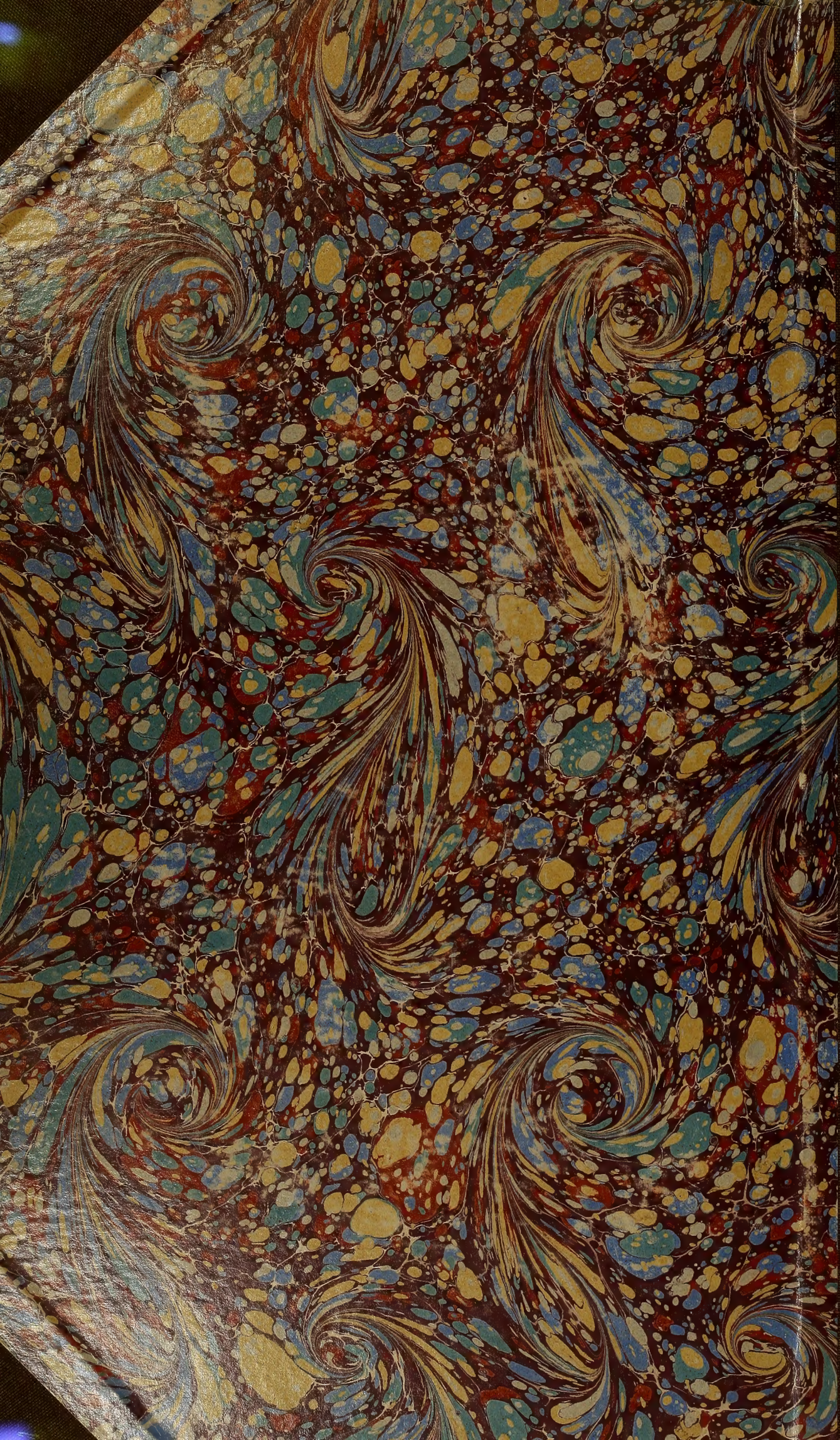
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